The Monthly Review

Published by the AMERICAN ELECTRO-PLATERS' SOCIETY

A Society for the Advancement of the Science of Electro-Plating

Best Wishes for a Merry Christmas

DECEMBER 1937

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The MONTHLY REVIEW

Published by the
AMERICAN ELECTRO-PLATERS' SOCIETY

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The Season's Greetings

This is the season of the year when we take inventory of ourselves. Those who are young and carefree dream of gifts and pleasures as we gather around the Christmas tree. Others, who have faced life's sterner realities, realize that there is more than pine tree and tinsel, more than the exchange of gifts with those we love.

It is fitting, as we stand upon the threshold of another year, to bear in mind the blessings and privileges we enjoy as a nation and as individuals. We are at peace with ourselves and with all peoples. Mother Nature has blessed us with an abundant harvest. Unlike other nations, we have freedom of speech, freedom of religion, and free institutions of learning. We are far removed from the tumult and noise of battle, our people are law abiding and contented, even in periods of industrial depression with its attendant distress. In short, we are indeed a favored nation.

Let us, therefore, as we ponder over our glorious heritage, remember others less fortunate than we, both at home and abroad. Let us guard our privileges against those who would tear down and destroy the principles on which our country was founded. Let us also use our influence as American citizens to outlaw war so that scenes such as are now being enacted by the war lords in Europe and the Orient may be forever eliminated from the national life of the people regardless of class or color. This is the duty of every citizen of the good old U. S. A. and represents the real Spirit of Christmas.

To our members, our friends, and our advertisers who have helped so splendidly during the past year, we wish you all a Merry Christmas, and all the prosperity and happiness that is possible as the old year fades into oblivion and the portals swing open hailing the advent of 1938.

A. B. WILSON
F. J. MACSTOKER
R. M. GOODSELL
AUSTIN FLETCHER
E. STEEN THOMPSON
W. J. R. KENNEDY

Editorial

The year 1937 is drawing to a close and six months have gone by since the writer was elected to the office of second Vice-president. Being in a position to keep in touch with the activities of the A.E.S. Branches, I have noticed that there has been much interest in securing speakers for branch meetings and also for annual educational meetings. This office has had the pleasure of supplying speakers for several of the branches and wishes at this time to thank those who have contributed their services.

I have noticed with interest the increase in membership as listed in our MONTHLY REVIEW. Much credit should be given to the Membership Committee who have contributed their services for this branch of our work. Also, to our Research Committee who have so untiringly contributed their time in giving us such splendid reports. Every member should read with interest our MONTHLY REVIEW which is filled with interesting data pertaining to the science of electro-deposition of metals. Much credit should be given to Bill Kennedy for his splendid work in editing this magazine.

It has been customary in the past that the second Vice-president has been selected as Chairman of the Educational Committee and immediately after his appointment his real work begins. It is necessary for him to contact speakers for the various branches for the coming year and also to select competent men for the abstract section of the REVIEW. It seems to me that this is a burden that is thrust upon the new Chairman of the Educational Committee. Inasmuch as it is necessary for him to immediately contact the above mentioned speakers and abstractors, by the time this program is completed it is as late as October and some of the branches have their programs completed for the year.

I am offering a proposal for your approval. Instead of contacting these speakers immediately after the appointment of the chairman, this work should be done at the termination of his office so that he can turn over a completed list to his successor who can immediately contact the various branches and provide them with a list of available men who would be willing to present papers at the branch meetings. This list can be added to if the chairman desires. I believe each branch should be given an opportunity to furnish someone who would be willing to abstract articles from monthly periodicals which publish articles pertaining to science of electro-deposition of metals. This could be turned over to the new chairman which would give him a complete list to select from.

The work for the 1938 Convention to be held in Milwaukee on June 13th, 14th, 15th, and 16th, is well under way with all committees working for a great Convention. I personally want to thank members of other branches who are offering their services to help make this Convention a success. Start making your plans now to be a guest of Milwaukee Branch on this occasion.

It is my wish that the coming year will be a happy and prosperous one for every member of the American Electro-Platers' Society.

R. M. GOODSELL.

TELEGRAM FROM MR. CHARLES H. PROCTOR

W. J. R. KENNEDY,
90 MAYNARD ST., SPRINGFIELD, MASS.

PLEASE CONVEY THROUGH THE MONTHLY REVIEW TO THE NATIONAL AND BRANCH OFFICERS AND THE ENTIRE A. E. S. MEMBERSHIP THROUGHOUT THE UNITED STATES AND CANADA MY SINCEREST WISH THAT ALL MAY ENJOY THE BLESSINGS OF A MERRY CHRISTMAS AND A HAPPY AND PROSPEROUS NEW YEAR.

SINCERELY,
CHARLES H. PROCTOR,
Founder of The A. E. S.

ATTENTION! **Here it is Boys!** **Hotel Schroeder!**

CONVENTION HEADQUARTERS 1938

June 13, 14, 15 & 16

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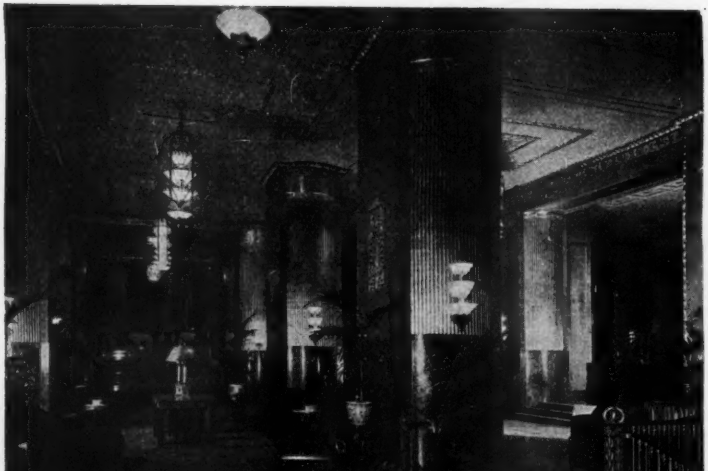

LOBBY looking toward DINING ROOM

Best Wishes for a Merry Christmas and a Happy New Year

A New Year's resolution
We all should make
Is to attend the Convention in 1938

Robert B. Goodall
Publicity Chairman

Pickling Ferrous Alloys

By MR. NATHANIEL HALL

Presented at Newark Branch October 1, 1937

THE science of pickling, the removal of oxides and various films from metals, has made great progress since the days when a spent acid bright dip diluted with water was considered perfectly satisfactory as a pickle formula. In the last few years we have seen continuous wide strip pickling developed to keep pace with the advances in steel strip manufacture. Tanks 60 ft. long, 7 ft. wide and 5 ft. deep, 4 in line and with a capacity of more than 15,000 gallons each are not unusual sights today. Steel tanks lined with rubber and acid proof brick have displaced longleaf yellow pine and lead linings as the materials of construction at an appreciable savings in maintenance cost. Most important from the standpoint of dollars and cents, chemical and metallurgical control have been developed to the point where operation is now assisted by charts and graphs worked out beforehand and closely followed in the shop.

New procedures and solutions have been developed for treating the different alloys, with the purpose of removing oxide and scale preparatory to finishing either by plating, painting, vitreous or lacquer enamelling or chemical colorings. Practically all of these developments have been published in various trade papers and transactions of the technical societies and many of the patented ones are available under licensing arrangements. The large manufacturers with technical staffs are kept informed of new ideas but the small metal finisher is at a disadvantage in that he has available neither the various papers nor sufficient time to read them all. Men offering new processes or products cannot afford to call on him and their only mutual contact is through advertising. Practically every mill and plating shop for instance has a pickling tank, but how many use inhibitors of any kind to reduce etching and save acids? Only a very small number of the small and medium sized finishing departments visited by the author in the last year were acquainted with this no longer new development.

It is hoped that this article will serve as a convenient source of information for the plater who is interested in applying modern methods of pickling to the materials which he handles. No attempt will be made to go into the theoretical aspects of the various processes, but the procedures, solutions and other pertinent data will be discussed; the scope of the subject necessitating that this be brief.

The pickling of ferrous alloys may be separated into three separate groups which, although they may overlap in some cases, are in general clearly demarcated. The first group and the most important from the standpoint of volume is the routine pickling of iron and steel to remove rust, mill scale and oxide from large quantities of work which are still to be fabricated and where pieces cannot be given individual attention. This is ordinary pickling as practiced by sheet and wire mills and foundries. The second group includes procedures for special types of pickling, such as temper color removal, treatment of stainless steel and various alloys, electrolytic pickling and combination pickling and rustproofing. The third group, most important from the platers' viewpoint, is the pickling of ferrous alloys as a preparation for subsequent adherent deposits, especially those of considerable thickness such as are used for building up worn or undersized parts.

STANDARD PICKLING

The oxides and scale which form on ferrous metals are particularly obnoxious from the standpoint of metal finishing. They are quite hard, having a hardness of about 6 on the Mohs' scale, on which the diamond, the hardest substance known today, has a hardness of 10. This means that in forming, the wear on the dies and tools is increased. In metal polishing, more abrasive must be used and wheel life is shortened. In painting and vitreous enamelling, adhesion is lessened and in the latter case discoloration of the enamel may be experienced. Being non-conductors of current, they naturally do not take on a metal deposit and in cases where the deposit bridges over small particles of rust and scale, blistering is almost a certainty.

The pickling medium which is used for the greatest volume of ferrous metals is a sulfuric acid solution of varying concen-

tration. Hydrochloric acid takes its place under some conditions where time is a very important factor because of its quicker action for a given concentration and temperature; this more rapid action is due, in great part, to the higher solubility of the reaction product, ferrous chloride being about 4 times as soluble as the ferrous sulfate at room temperature. If it is possible to operate the pickle at elevated temperatures however, this advantage of hydrochloric acid is quickly offset and since sulfuric acid is cheaper and the freight charges are lower because less water is transported along with each unit of pure acid; and, since in addition there is no such objectionable fuming as is experienced with hydrochloric acid, sulfuric acid is always used under these circumstances.

The uncombined sulfuric acid content is usually between 5 and 15% by weight. Iron and steel are pickled at temperatures between 150 and 180 deg. F. for optimum operation, although room temperature may be used, which of course requires more time. Increasing the concentration above 20% is of no advantage so far as the rate of pickling is concerned. The higher concentrations are used at the lower temperatures and it has been found in practice that an increase of 10 deg. F. is equivalant to an increase of 1% in acid concentration. The ferrous sulfate which forms does not interfere with the pickling and in many plants the solution is operated with such a high concentration of ferrous sulfate (with correct acid concentration) than on cooling to room temperature the excess crystallizes out and is raked out each morning before starting up. In some installations the pickling tubs are filled at the beginning of a shift and after one or two rechargings with fresh acid, the spent solution is run into the sewer. Where large quantities of acid are used, the disposal of the waste may present some difficulty. With the view of alleviating this condition a method has been developed whereby the ferrous sulfate is dried and burned and the gases used to manufacture fresh sulfuric acid. The by-product is red iron oxide which is the basis of much of our jewelers' red rouge.

A very important development in pickling practice is the use of inhibitors to prevent attack on the iron and steel while allow-

ing the scale to be removed. Since for every pound of iron dissolved, two pounds of sulfuric acid are used up, it is obvious that great savings are possible. Hundreds of substances, patented and unpatented, have been found suitable for diminishing the attack of the acid on the steel, among which to mention a few are: gelatine, starch, yeast, pyridine, quinoline, naphthalene-sulfonic acid, anthracene oils, glycerine, aldehydes, hydroxylamine, alcohols, ketones, sulfite pulp liquor, trithioformate, carbon disulfide, bone oil, sulfurized grain steel water, thiosulfate treated corn steep water, dimethylcyclohexyl-thiourea and other substituted thioureas containing a cyclohexyl group, flour paste plus tin chloride, dimethylaniline, formalin, arsenic, antimony, tin and even sodium chloride. Also turkey red oil, fish glue, hide glue, soot, furfural, paratoluidine, tannin, and linseed oil. 2 to 3% of the metallic inhibitors by weight of acid are used while varying proportions of the inorganic materials are required depending on the type of iron and steel, the temperature, the breakdown rate and other factors. 0.1% of the weight of the acid is often used but this should not be taken as a universal figure. Thus for ordinary low carbon sheet steel which is to be given a final cold rolled finish, no etching is desirable and a large amount of inhibitor such as $\frac{1}{4}$% may be used. For billets which have a heavy scale $\frac{1}{2}$% may not be excessive. In galvanizing steel sheets a slight etch is desirable for bonding and a smaller amount of inhibitor such as 0.1% or 0.05% may be used. Inhibitors are not to be used indiscriminately and there may be certain cases where no inhibitor should be used. In vitreous enamelling for example there is no chemical bond between the coating and the steel, the adherence depending on the flowing of the enamel into the pores and irregularities in the surface of the steel and iron and locking itself. It is evident that in such a case a high degree of surface etching is of the utmost importance, and the use of an inhibitor may be detrimental.

Where metals are to be finished by plating, minimum attack of the basis metal is desirable and the ratio of inhibitor should be adjusted accordingly. In connection with pickling before plating, it might be wise at this time to differentiate, without

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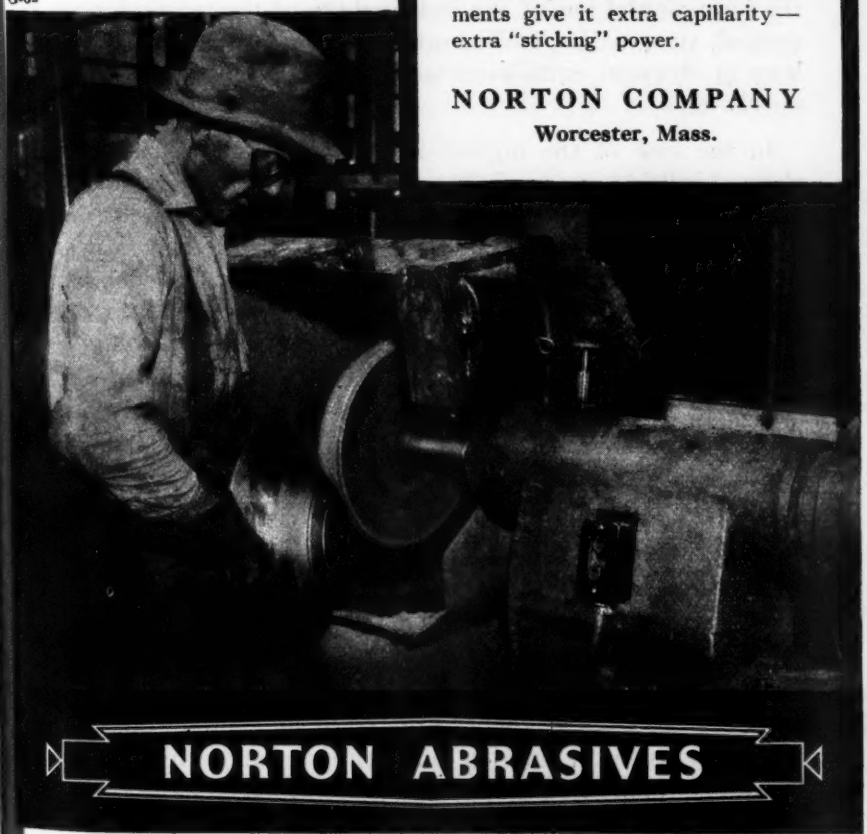

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going too deeply into the theoretical aspects, between the metallic inhibitors like arsenic and the more modern organic inhibitors. If a piece of iron covered with oxide or scale is immersed in an electrolyte such as sulfuric acid, an electrolytic cell is formed in which the iron is anodic to the scale. The former therefore dissolves and hydrogen gas is plated out on the latter. When a metallic inhibitor such as arsenic is added, being more noble than iron it plates out by cementation, forming a new cell:

IRON / SULFURIC ACID / ARSENIC

In this cell also the iron tends to dissolve and hydrogen to deposit on the arsenic. The hydrogen overvoltage of the arsenic is so high however that the discharge of gas is prevented. Since the formation of one of the end products of the reaction is repressed, the reaction itself must be repressed according to the laws of chemical equilibrium and the iron is prevented from dissolving.

In the case of the organic inhibitors which are positively charged colloids or organic bases, the inhibitor migrates to the cathodic scale areas and forms a non-conducting layer or according to another theory a positively charged layer, increasing the interfacial resistance in the first case and repelling the like charged hydrogen ions in the second so that they cannot be discharged. Thus we can see that in the case of the metallic inhibitor the effect takes place on the surface of the iron leaving it covered with a film of metal which is not removed by rinsing while with the use of the organic inhibitor the effect is on the scale and a hot water rinse is usually effective. It is essential that the inhibitor be completely removed for proper adhesion of electrodeposits and therefore the plater will usually find it convenient to use the more easily removable organic materials.

Tank construction for sulfuric and hydrochloric acid pickles is standard in all large plants, namely acid proof brick backed with rubber and supported by an outside steel tank. The brick sheathing protects the rubber from mechanical injury and also acts as an insulator, lowering radiation losses and extending the life of the rubber itself because the temperature of the rubber is less than that of the solution. If a brick sheathing is not

provided for protection, wood planks are placed around the top of the tank in order to protect the rubber. On a large tank, $\frac{1}{4}''$ rubber and 8″ brick are satisfactory. In very large installations, acid brick lined concrete tanks are sometimes used, the brick being set in an acid proof cement. If cracking of the brick occurs, the concrete is eaten away by the acid. Lead lined steel and wood tanks were used in the older installations but they are slowly being superseded since the lead is prone to disintegration in which case the tank itself begins to leak shortly afterward. One important advantage of the rubber lined tank is that the lining is securely bonded to the steel and any defect in the lining evidences itself soon by a small hole in the steel tank which can then be easily repaired. In the case of lead linings, seepage is bound to occur between the lining and the tank wall, resulting in corrosion over a greater area of tank surface. Lead ot course, is not used if the pickle contains hydrochloric acid or acids containing chlorides because of the solubility of the lining in such solutions.

Heating is by means of lead or duriron open steam pipes which also act to agitate the solution. It is important that the steam jet should not impinge on the brick because in starting a cold tank, the high temperature will cause cracking. The heat will also cause the rubber lining at the point of impingement to deteriorate rapidly.

SPECIAL PROCEDURES

For the pickling of cast iron, a hydrofluoric acid solution is usually used, the main purpose being the removal of the molding sand. The common pickle contains roughly 5% by weight of pure acid or about 10% of the commercial 48% hydrofluoric acid. Sulfuric acid is often added to hasten rust removal. A typical formula is:

Sulfuric acid.....3 parts by volume
48% Hydrofluoric acid.....1 part by volume
Water.....4 parts by volume

An alkaline dip after the rinse is good practice in the pickling of castings in order to neutralize the acid in the pores. Lime is the favorite addition to neutralizing tanks, one ounce to a

gallon of hot water being used, except if the castings are to be plated.

For pickling cast iron and high carbon steel the addition of zinc has been recommended, although the reason for this addition has not been made clear. One published formula consisted of:

Sulfuric acid	½ gal.
Water	5 gal.
Zinc sulfate	½ lb.

Langbein recommended the following for bright pickling cast iron:

Water	10 quarts
Zinc	2 oz.
Sulfuric acid	28 oz.
Nitric acid	12 oz.

The removal of rust spots from finished articles is a problem which at some time or other confronts every metal finisher. In the nickel plating of nail files, because of inefficient cleaning or pocketing of gas bubbles, rust spots show up in the teeth after a time. Old time cutlery men would immerse such files in concentrated hydrochloric acid for a few minutes. This was a very disagreeable operation and did not produce satisfactory results because of attack on the nickel and iron and the possibility of acid retention in the teeth. An alkaline pickle which contained citrates was found to be suitable in this case. 10 oz. of citric acid were dissolved in ½ gallon of water, ammonia was added until the solution was alkaline to litmus and the whole was then diluted to one gallon in an enamelled pot. Although this might be too expensive for some pickling problems, in the present instance it was suitable because of the small volume taken up by the files and the consequently small sized pickle. The files were immersed in bulk at boiling for between 10 and 20 minutes at the end of which period no rust spots were visible and attack of the files was absent.

A formula consisting of tartaric acid plus tin chloride was also tried for this purpose, and although its performance was satisfactory, it was not as good as the citrate pickle. The formula used was:

A.	Tin Chloride	14 oz.
	Water	1 gal.
B.	Tartaric acid	½ oz.
	Water	1 gal.

A and B were mixed and operated at about 175 deg. F. The tin is present in order to keep the iron in the reduced form. The solution should be rejected when it turns yellow, showing the presence of ferric ions which attack the iron.

In the polishing and sharpening of steel instruments and tools, it is often necessary to remove the temper color. The old method was to immerse the work in concentrated hydrochloric acid. An improvement on this method was the addition of formalin or ethanolamine as an inhibitor. Because of the disagreeable characteristics of this reagent it has been recommended that a solution containing 50% by volume of glacial acetic acid plus 2% boric acid be used or else an immersion in 10-25% ammonium persulfate solution. The latter leaves an irridescent film on the work in some cases and results in etching if the period of immersion is long.

In spite of the presence of the inhibitor in pickling it may sometimes be noted that the basis metal becomes pitted and corroded even with a very low acid concentration. This effect is due to the existence of the dissolved iron in the oxidized or ferric state in which it functions as an active corroding medium. The addition of a reducing substance will minimize this effect and tin salts have been found to function so admirably that concentrated hydrochloric acid with the addition of 2% of antimony trioxide and 5% of stannous chloride can be used to determine rust quantitatively.

The addition of oxidizing agents to a weak solution of hydrochloric or sulfuric acid will result in a brighter finish but it is essential, of course, that the progress of the pickling be carefully controlled so that etching of the iron due to the presence of ferric ions will not be appreciable. A 1% solution of either acid to which has been added 2% of potassium or sodium nitrate or potassium persulfate may be used as a bright pickle at 175 deg. F. If the scale or rust is heavy, a preliminary pickle containing twice as much acid is used first followed by a short dip in the above mentioned solutions.

PHOSPHATE PICKLING

The use of phosphoric acid as a pickling medium is becoming more and more important especially in connection with subsequent painting or lacquering since there is formed on the steel a phosphate coating with definite bonding and rustproofing properties. Various formulas are in use. One contains the following:

Phosphoric acid	26%
Sulfuric acid	2%
Lactic acid	53%
Water	18.9%
Inhibitor	0.1%

A patented mixture which cleans, pickles and rustproofs in one application contains:

Phosphoric acid (85%)	1 volume
Ethanol or other similar solvent	1 volume
Water	1-5 volume
Isopropyl ether	1-5 volume

Another patented mixture which acts as the above but is very viscous and may be applied without immersion is prepared by heating a solution containing 33% of phosphoric acid and 3% of a sulfated alcohol of 6-18 carbon atoms at 120 deg. F. for 4 hours. The resulting product is applied to the greasy and rusted iron and after one hour is washed off.

Immersion of the phosphate coatings in a solution containing 4 oz./gal. of chromic acid, phosphoric acid or oxalic acid for 1 minute or less at a temperature near boiling improves the paint adherence. Aluminum nitrate may also be used according to a recent patent.

Other phosphate processes such as the Parker process and Granodizing are used mainly for rust proofing and are not considered to come within the scope of this article.

Stainless steels usually require pickling for the removal of scales due to forging, hot rolling, annealing etc. Hydrochloric acid is a common constituent of the solutions used for this

purpose with proper modifications for the different alloys. It is very difficult to do a good pickling job on these alloys and control of the metal working operations is the best assurance of good results in the removal of the scale.

Various patents have been granted on pickles for these metals. One mixture patented in Germany contains:

Hydrochloric acid	50%
Water	44%
Nitric acid	5%
Glue	0.1%

Laboratory tests indicated that the action was too slow unless the solution was heated and the metal was found to be badly pitted after removal of the scale.

Another formula consists of:

Acetic acid (100%)	40-50%
Nitric acid (100%)	10-15%
Hydrochloric acid (100%)	4- 8%
Water	Remainder

In the pickling of straight chrome steel containing no nickel such as is used in cutlery manufacture the scale is loosened by immersion in 10% sulfuric acid at 150 deg.F. and removed by subsequent immersion in 10-15% nitric acid at 140 deg.F. Pitting may be experienced if the period of immersion is too long or the acid concentration is too high.

ELECTROLYTIC PICKLING

The use of current in the removal of rust and scale is very often desirable as a means of increasing the rate of pickling and decreasing the attack on the metal itself. Direct, reverse and alternating current have each found application in the industry. Just as in electrolytic aklaline cleaning, the evolution of gas tends to lift off the loosened scale and oxide.

Cathodic pickling is the most common procedure. As is well known the gas evolution is twice as great at the cathode than at the anode resulting in a more vigorous scrubbing action. The hydrogen gas tends to reduce the oxides and the attack

on the iron is lessened because of the counter electromotive force acting against the iron-scale couple. A solution used for this purpose may be 30% sulfuric acid having a specific gravity of 1.2. The solution is preferably operated at about 125 deg.F. with a current density of from 50 amps/sq.ft. up. About 3-5 volts is required.

The best known of the cathodic processes is the Bullard-Dunn Process. A 10% solution of sulfuric acid to which is added sodium sulfate for conductivity is used at 150 deg.F. and 60 amp./sq.ft. A small amount of tin is added to the solution and one or two tin anodes are used to maintain the tin content. As soon as the scale is removed and the iron exposed, a thin film of tin deposits and protects the surface. If it is necessary to remove the tin later, this can be done anodically in a solution of caustic soda and trisodium phosphate. In order to prevent the dissolved iron from being oxidized at the anode, silicon iron anodes (Duriron) are used. A film of silica forms on the surface of the anodes and acts as a diaphragm. Glue is added to the solution to improve the smoothness of the tin deposit.

Stainless steel may be pickled cathodically in a solution of hydrochloric acid, the concentration of which may vary over wide limits.

The Ungerbock-Morscheck method of electrolytic pickling is an anodic process. The solution is 0.4 N. in ferrous sulfate and also contains 0.3-1.5% sulfuric acid. A current density of 5-10 amps./sq.ft. is used at 25-35 deg. C. The pickling is independent of the current density. This process is claimed to be twice as rapid as immersion in a 10% acid pickle and has the advantage of low cost since there is very little replacement. The energy required is 0.00013 KWH per sq. ft.and the cost for chemicals is about $0.00067 per sq.ft. This method is applicable to the chromium-nickel alloys, which are usually passive, if the ferrous sulfate content is raised to about 1.0 N. If alternating current is superimposed, the pickling is retarded and the attack of the iron is increased.

An important advantage of anodic pickling is the absence of hydrogen embrittlement. Transformer steel may be pickled by making it the anode in 30% sulfuric acid at 10 amp./sq.ft. and

0.2-0.6 volts. A procedure which has been recommended for high speed steel is reverse current at 25 amps./sq.ft. in a solution containing 15.3 oz./gal. of caustic soda and 2 oz./gal. of citric acid. This is followed by a dip in 50% by volume of hydrochloric acid.

In the Hanson-Van Winkle-Munning electrolytic bright dip the scale is first removed by a cathodic treatment in sulfuric acid at above 100 amps./sq.ft. and then brightened by an anodic pickle in another sulfuric acid solution under different and controlled conditions.

Alternating current is used in the Ferrolite system which makes use of a 5-10% solution of sulfuric acid containing 10% of the total acidity as gluconic acid, at 160-180 deg. F. The work may be placed in baskets between two rows of electrodes since the action of the current is indirect.

PICKLING IRON AND STEEL FOR ELECTROPLATING

The pickling procedures discussed above were mainly for the removal of rust and scale. For the preparation of iron and steel for electroplating many of them will be found to be satisfactory for routine work. Since the advent of chromium plating for mechanical resistance and wear however, the problem of adherence has become most acute. The situation is comparable to that which existed at the time that ornamental chromium plating was introduced, when the stresses produced by the chromium plating necessitated complete revamping of cleaning, pickling and nickel plating procedures in many plants in order to eliminate ruinous blistering. Heavy chromium, nickel and iron plating as a means of building up worn parts has introduced new problems for the plater. Close control of the plating solution has eased the way to a very great extent but the adherence of the deposit or rather its lack of adherence is still the platers' bugaboo. Chromium plating of dies, gages, rolls and other expensive articles is necessarily an expensive process. Rejects are not premissable because of the cost and as a result, more care is taken in the preparation of this type of work than in any other type of plating.

It was found very early in this trade that the regular alkaline

cleaning methods could not be improved upon and it was on the subsequent acid pickle that all the attention was concentrated. Immersion in an acid pickle was soon found to be generally unsuitable for this class of work and the use of current was resorted to. Cathodic pickling resulted in hydrogen embrittlement in some cases and in the plating out of impurities on the article in others, usually with fatal results so far as adherence was concerned. The use of an anodic acid treatment was the next to offer possibilities. It has long been known that in concentrated solutions of sulfuric acid, an iron or steel anode will become passive under certain conditions, this principle having been made the basis of the sulfuric acid strip for the removal of nickel and copper deposits from ferrous metals.

The sulfuric acid strip was first used for the anodic pickling probably because it was the most convenient. This solution is about 75% by weight of sulfuric acid and requires 12 volts. The initial current density is about 50 amps./sq.ft. dropping to zero after about 10 minutes. The anodic treatment serves three purposes. It acts to remove any adsorbed hydrogen from the electrolytic alkaline cleaner or preliminary pickle. It gives the surface a mild etch so that the adherence is improved and the evolution of oxygen gas serves to sweep away any insoluble carbonaceous material. (British add 1 oz./gal. $Cr\ O_3$).

Altho this pickle was quite satisfactory, the high voltage required to overcome the resistance of the bath was a serious drawback together with the fact that rubber linings are not recommended for such high concentrations of sulfuric acid and lead linings might result in a film on the iron and steel articles which would act to lessen the adherence. In order to overcome these disadvantages of the otherwise satisfactory anodic sulfuric acid pickle, the concentration was reduced and the current density increased to maintain the passivity.

The practice in many plants pickling iron and steel for subsequent heavy adherent electrodeposits at present is to treat the work anodically in a 25-30% solution by weight of sulfuric acid at 6 volts which will deliver about 150 amps./sq.ft. This solution can be contained in a rubber lined steel tank. It should be noted that the generator capacity required is higher for the

less concentrated solution, but due to the fact that most plants doing this type of work have their generators connected for 6-8 volts and have high amperages available, it is more economical to hook up to the tank bus-bar than to install a 12 volt machine for a few minutes operation daily. Since high current densities are used in building up heavy deposits, it is difficult to balance a three wire 6-12 volt system and this method of providing the higher voltage is rarely resorted to.

For iron and steel parts which are to be chromium plated directly, such as dies, gages, mandrels, rolls, etc., a more suitable solution than the above mentioned sulfuric acid is one containing 28-30 oz./gal. of chromic acid. If high speed steel, carburized or cast iron is being treated, the sulfuric acid pickle precedes the chromic acid treatment. A typical cycle for steel dies is as follows:

1. Degrease
2. Cathodic cleaning in alkaline cleaner
3. Rinse in warm and cold water.
4. Immerse in 5% hydrochloric acid solution.
5. Rinse in cold water.
6. Apply stop-off and rack with auxiliary anodes if necessary.
7. Repeat cleaning and pickling.
8. Etch in the Chromic acid solution at 6 volts for 1-2 minutes with reverse current.
9. Without rinsing transfer to the chromium tank and plate.

A lead lined tank is used for the chromic acid solution which must be entirely free from sulfate. Any sulfate impurity in the chromic acid, usually not more than 0.1%, is precipitated by the addition of barium carbonate.

A treatment which has been recommended for high speed steel is anodic treatment at 25 amps./sq.ft. in:

Sodium hydroxide	20 oz./gal.
Citric acid	2 "

until gas evolution is uniform. Then the work is rinsed and dipped momentarily in hydrochloric acid.

Recently a new method was developed for treating not only polished iron and steel but also chromium plate, nickel plate and stainless steel to provide a surface which will take an adherent deposit. The article after cleaning is made the cathode

in a solution containing 240 grams/liter of single nickel salts and 50 grams/liter of sulfuric acid at 35 deg. C. for 5-10 min. and 150 amps./sq.ft. This deposits a thin film of nickel at very low efficiency, said to be 5%. The electrolytic treatment is followed by a copper plate 0.001-0.002 inches thick or by heat treatment at 200 deg.C. for 2 hours and is said to result in better adhesion than either the chromic acid or sulfuric acid etch.

In attempting to deposit a nickel coating on some stainless steel bushings which were cut undersize this solution was tried by us after other methods failed and was found to be satisfactory. The stainless steel was degreased, scrubbed with pumice and lime and immersed in a 1:1 hydrochloric acid dip at 175 deg.F. until gassing was uniform. The bushings were rinsed and plated in the above solution at 100 amps./sq.ft. for 5 min. and transferred to a warm nickel solution in which the deposit was built up at 20 amps./sq.ft. Neither copper plating or heating was used and the deposit adhered perfectly when the bushings were force fitted into castings. If nickel anodes are used in the cathodic treatment, the metal builds up rapidly and the acidity drops. Lead anodes are advised with the addition of one or two nickel anodes when the metal content drops.

Immersion in a solution containing one pound of nickel chloride and one half gallon each of water and hydrochloric acid has been recommended for pickling stainless steel before plating but the effectiveness depends on the type of alloy and the metal to be deposited. Direct current may be used in this solution for better adhesion.

A patent has been granted on the preparation of stainless steel for chromium plating which involves the shorting of the anode to the work bar for a few seconds while the work is in the chrome tank and then removing the short and plating.

All the solutions and procedures discussed in this article are subject to modification for any one particular material and all the possible variations in the pickling cycles are sufficient to tax the ingenuity of any plater. These methods should only be considered as a starting point and their successful practice will usually be entirely dependent on the common sense and carefullness of the operator.

Rochelle Salts Copper Bath

By EDMUND S. JEVELI
Chemist, A. S. Campbell Company

Read at the Boston Branch Meeting, November, 1937

THE Rochelle Salts Copper Bath today is being widely used, especially in connection with the copper plating of zinc base die castings since it can be operated at a higher current density than a cyanide copper solution. Operating the solution at 45 amps./sq.ft. and assuming a cathode efficiency of 70% we could obtain the necessary .0003" in five minutes. This is actually being done in production today. It is also considered superior to the regular cyanide bath for an undercoat for bright nickel deposits due to the fine grain structure obtainable. The full possibilities of this solution have not as yet been realized since the bath had not been thoroughly investigated.

In the past the bath has been tried by a good number of platers, but due to the lack of knowledge it did not gain wide use until a few years ago. We find a reference to this solution in Langbein's 1905 edition, it being referred to as the Weil Solution. It is mentioned in a paper by Barclay and Hainsworth published in 1912. It was investigated by Dr. O. P. Watts in 1915, he found that the Rochelle salts helped corrode the anodes. Recently a great deal of work has been done at the Chrysler Motor Corp. under the direction of Carl Heussner. The effect of pH on the anode and cathode efficiencies has been investigated by George Hogaboom of the Hanson-Van Winkle-Munning Company.

In the Rochelle Salts Copper Bath the metallic content runs about the same as in the straight cyanide bath. The metal content varies from 2 oz./gallon to 4 oz./gallon. A low metal concentration results in a higher cathodic polarization and therefore to greater throwing power. The cyanide as free cyanide can vary from .2 oz./gallon to 1 oz./gallon. Some workers even recommending no free cyanide, altho it has been found that some free cyanide is essential to maintain good anode corrosion. The free cyanide also affects the throwing power,

better throwing power being obtained at the low concentration.

The Rochelle salts can be carried as high as 8 oz./gallon, equally good results are obtained at 4 oz./gallon so that due to the cost of the Rochelle salts it is preferable to run the bath at 4 oz./gallon.

The striking difference between this bath and the cyanide bath is in the operating temperature and current density. The bath should not be operated cold and the current density should be between 20 to 60 amp./sq.ft. to obtain the best deposits.

To summarize the formula which gives the best results especially as an undercoat for bright nickel:

Copper Metal.....2 to 2.5 oz./gallon
Free Cyanide.....4 to .6 oz./gallon
Rochell salts.....4 oz./gallon
Temperature of operation..140° to 160° F.
Current Density.....20 to 60 amps./sq.ft.
pH.....11.8—12.3

In controlling the solution the metal content is controlled by a simple analysis and is brought up to strength by the addition of copper cyanide. The free cyanide is checked by a silver nitration titration which should be done daily. As to the methods of determining the pH the colorimetric method is standard. We use the Hellige Wheel.

To raise the pH, caustic soda is the most convenient to use. The pH is lowered by the addition of sodium acide sulphate. R. O. Hull of the Grasselli Chemical Company has shown that the addition of sodium acid sulphate has no detrimental effect upon the operation of the solution.

Sulfate in a copper solution is not new. In the past, cyanide copper solutions have been made using copper sulfate as the metallic salt. This of course would introduce considerable sulfate to the bath. No trouble was experienced in operating these baths due to the sulfate, so we can safely conclude that the addition of sodium acid sulfate is not detrimental to the

solution although care should be taken in adding it that we have adequate ventilation.

The method for the determination of the Rochelle Salts in a copper cyanide bath has been recently developed by the Hanson-VanWinkle-Munning Company and I think it will be well worth while to take this up in detail. The method depends upon the fact that potassium acid tartrate is insoluble in alcohol-water mixtures. The cyanide is first eliminated, followed by the removal of the copper as copper sulfide. Then the tartaric acid radical is precipitated as potassium acid tartrate. *In detail the method is as follows*:

1. Fill the sampling burette with the solution to be tested. Run a 10 cc sample into a 250 cc beaker.

2. Add 10 cc concentrated HCl, 15 cc distilled water, and boil until liquid is greenish in color and free from turbidity.

3. Add 10 cc of a 15% solution of sodium sulphide while stirring, let settle, and filter. Wash with small amounts of distilled water to which a few drops of sodium sulphide have been added.

4. Boil the filtrate collected in a 250 cc beaker until its volume is reduced approximately one-third and add 35% K_2CO_3 solution until alkaline to litmus.

5. Evaporate until volume is reduced by one-half and add glacial acetic acid until solution is just acid to litmus.

6. Continue the evaporation until the volume has reached 20 or 25 cc, remove from hot-plate, stir in 7 cc of glacial acetic acid, and let stand 15 minutes with occasional stirring.

7. Add 100 cc of 95% ethyl alcohol and let stand 15 minutes with occasional stirring.

8. Filter and wash four times with 25 cc portions of ethyl alcohol or until liquid drawing from funnel is neutral to litmus.

9. Transfer filter paper to beaker in which precipitation was made, add 150 cc distilled water, 5 drops thymolphthalein indicator, and heat to boiling.

10. Titrate with 0.1 N NaOH until one drop produces a faint blue color. The number of cc's multiplied by .378 equals ounces per gallon Rochelle Salts in plating solution.

In operating the bath precautions necessary to follow are:

1. Keep all dirt, buffing compounds, etc., out of the solution, otherwise it will be necessary to dump often.

2. Do not operate the bath cold.

3. Operate bath at high current densities.

4. Do not let the copper metal get high in the bath. This can cause rough work.

5. Do not use too many anodes or your metal will be almost uncontrollable.

It is also well to have some Caustic soda in the bath. We get a favorable modification of the crystal up to .5 oz./gallon, above this no improvements have been noticed.

Operating under these conditions in production the overall efficiency of the bath is about 70%.

The temperature at which the solution is operated must be high in order to insure good conductivity which permits the use of high current densities. High current densities are favorable to a light colored deposit. The bath has been especially developed for high current density. With increase in current density we get a drop in cathode current efficiency but not anything like we obtain in the regular cyanide bath. Operating at 60 amps./sq.ft. we can still obtain a cathode efficiency of 70%. In fact in Detroit where this bath is widely used it is being operated at 90 amps./sq.ft.

We come now to the most important factor which must be controlled in this solution to obtain consistently good results, and this is the pH of the solution. At the low pH values 8.2-10.6, the anodes coat over and cause polarization. The color of the deposit at the low pH values is good, a light colored deposit being obtained. The anode efficiency is fairly constant at all pH values which is another difference from the regular cyanide bath. In the regular cyanide bath when the pH is above 13.0 the anode efficiency drops to 5%.

In the pH range of 11.8-12.3 the anodes remain clean and the anode efficiency averages 100%. The cathode efficiency is at its maximum of 94%. These efficiency values are those obtained in the laboratory. In actual production using a high current density we do well to obtain 70 to 80 percent efficiency in this pH range.

The pH must also be closely controlled if the solution is operated in an iron tank since the Rochelle Salts exert a solvent action on iron, forming complex salts. If the iron gets into the solution ferricyanide will form which will increase the resistivity of the solution necessitating a higher operating voltage.

The effect of the pH on the coatings formed on the anodes was studied closely. It was of interest to determine if at a pH below 11.8 whether the addition of sodium carbonate would clean the anodes. Not enough sodium carbonate was added to raise the pH to 11.8. A solution was run at a pH of 10 with 1 oz./gallon of sodium carbonate. The anodes coated over heavily; the carbonate content was brought up to 2 oz./gallon with no effect upon the anodes. The pH was raised to 12 with sodium hydroxide and the anodes cleared.

The effect of sodium cyanide on the anode coatings was similar. At a low pH (10.6) altho the free cyanide was .6 oz./gallon the anodes coated over, on raising the pH to 12 they also cleared. It was evident that to keep the anodes clean it was necessary to control the pH.

These results showed that the pH was important but we are not to believe that the pH is the only factor which must be controlled. The metal content, free cyanide, rochelle salts, and carbonate must also be controlled to obtain good results.

Research Department

One can become poetic or romantic about a beautiful piece of art. The same holds true of our industry. Don't we all like to romance about our own jobs? We are at heart artists; perhaps to some that is stretching a point too far. I personally fail to see it, for, if it were not for this artistic sense we have, we would not in many cases have suffered the inconveniences we have to put a job over.

But to-day another sense is creeping into our picture — realism; that could be another name for our Research Department.

The company or individual for whom we are working is not so interested in our art as an artist; he is a realist—otherwise he would not be in business.

He is interested in the commercial value of our art, along with the durability of it, and through our research activities we are able to talk in terms of durability, plus beauty, and for us to hold the position we have in industry and to keep pace with the trend, we have got to sell our art on the story of durability.

Have you ever spoken to your employer about what has and is being done on his behalf at the Bureau of Standards in Washington? It is true the A.E.S. and the A.S.T.M. and others interested have taken research to heart, but the man who stands to gain most, knows little or nothing about this most important phase of electro-plating. The fault is all ours, as individuals; we have not told him a thing about just what it is all about and he should know. And, if we are able to tell him in terms that he understands what research means to him and us, I feel we would create a better understanding between you as a plater and your boss and all that he stands for; at present, perhaps, he does look upon us platers as temperamental artists.

With this thought in mind, it is proposed to hold a special meeting, here in Boston, of local manufacturers, to sound out this theory, to tell them about research and the plating industry. At this time we hope for the success of such an undertaking, and that it will be the first of many such meetings all over the country.

The Pilgrims landed in this part of the country and they made a pretty good job of developing these United States, and we of your research committee do hope for the same success in this undertaking.

But do not let all the work fall on your research committee; do some missionary work yourselves. Tell your boss, tell everybody, that the plating industry can and does offer maximum protection at minimum costs.

How do you know? Study the work that has been done to date by Dr. Blum and Mr. Strausser at the Bureau of Standards on behalf of the entire plating industry. I do not think there is another industry that has so much data available that it does not use to advantage. If your boss had financed our research, he would be using the information gained to the greatest advantage. Why? Because he is a realist.

BERT SAGE,

Member of Boston Branch—Member of Research Committee.

DETROIT ANNUAL EDUCATIONAL SESSION AND BANQUET

The first annual Educational Session and Banquet of Detroit Branch was held on Saturday, Dec. 4, and had all the appearance of a meeting of the National Convention: the large number present, the past and present national officers, and even the program were all reminders of the yearly meetings of the A.E.S.

Chairman Charles H. Eldridge of United Chrome Corp. presided, after

being introduced by the President of Detroit Branch, and also President of the A.E.S., A. B. Wilson. The first speaker was Dr. William Blum of the National Bureau of Standards who chose for his subject, "The Value of Electroplating Research to the Manufacturing Industry". George B. Hogaboom of Hanson Van Winkle Munning Company, followed Dr. Blum. Mr. Hogaboom spoke on "The Value of Thickness of Electro-deposited Coatings". Professor Edwin M. Baker, University of Michigan, was the next speaker, his topic being, "Preparation for Cleaning of Metals Prior to Plating". The last speaker, Floyd F. Oplinger of R & H Chemicals Dept, E. I. du Pont de Nemours, addressed the audience on "Practical Methods for the Disposal of Alkali and Metal Cyanide Solutions".

About 275 persons attended the Educational Session and were keenly interested in the papers read and discussed; each speaker was warmly applauded as he finished the reading of his paper.

The Banquet in the evening was a tribute to the hard work of the Committee in charge. George Nankervis had charge of the arrangements, assisted by W. W. McCord. The ballroom was beautifully decorated with balloons, and the meal was all that could be desired. The floor show following the banquet had the audience on their feet most of the time, each event receiving round after round of applause. All in all, it was a night that will long be remembered by the 430 persons who attended.

In addition to President Wilson, R. M. Goodsell, 2nd Vice President, and E. Steen Thompson, Past President, represented the National organization.

Members of Research Committee present held an informal meeting before the Educational Session started.

Past President of the A.E.S., T. F. Slattery, called a meeting of the Revision of the Constitution Committee on Sunday morning, Dec. 5, at the Statler. A four-hour discussion on the proposed changes followed. This was a very worth while meeting in which the members expressed themselves freely. There was the utmost harmony and cooperation. In view of the fact that the Revision is being so thoroughly scrutinized by the committee, it is hoped that all members of the A.E.S. will consider the items carefully when they come up for discussion at the local branches as a lot of time and study has been spent in trying to bring our Constitution up to date.

PHILADELPHIA ANNUAL MEETING

From numerous complimentary reports and the large attendance at our annual meeting and dinner dance held Saturday, November 20, 1937 at "Adams", the chairman Mr. Nat Verelle may well feel proud of his banquet committee's efforts and with this incentive, start planning now for an even bigger and better meeting in 1938.

All the papers were well received with excellent attendance and attention, while the discussions showed the interest in the subjects considered. Our past president, Mr. Albert Hirsch, is to be complimented for his part in securing such a well received educational program.

Our membership should be enthused to higher achievement after examining the bright nickel plated samples of toy pistols exhibited by our fellow member Mr. William Bannion, of the Hubley Manufacturing Co., who has developed his own solution and process for finishing the excellent exhibits shown. Keep up the good work, Bill, and more power to your generators.

We were pleased to see such excellent representation from the National Society as evidenced by the presence of the 1st and 3rd vice-presidents, Franklyn J. MacStoker and Austin Fletcher, and the large delegations from the New York and Newark Branches, including the president of the New York Branch.

Our Branch president, Mr. Joseph Underwood, has been untiring in his efforts to increase our membership and during the breathing spells of the meeting succeeded beyond his own expectations in securing new applications.

Mr. Andy Arcari made his usual personality hit by his playing of the accordion and at times had every diner yelling nonsense with him, while Miss Norma Norton enlivened the dance intermissions with her original songs excellently accompanied by Miss "Dolly" Robson, the daughter of Mr. A. M. Robson of the Reynolds & Robson Supply Co. Orchids to "Dolly" for a fine extemporaneous performance which brings out the thought why not have a big home talent entertainment? This should be easy, judging by the many fine voices heard, terpsichorean activities of big apple dancers and heart-rending dulcet toned quartettes from the neighborhood of the ever-popular refreshment bar, while many monologue artists were present.

The following firms are deserving of our thanks for the beauty and diversity of the door prizes donated by them as well as an individual prize given by our past President, Mr. George Gehling:

Brown Instrument Conpamy
Divine Bros. Company
J. B. Ford Company
Fox Products Company
Gumm Chemical Co., Inc.
Hubley Manufacturing Co.
International Chemical Co.
Lea Manufacturing Co.
Maas & Waldstein Company
Mitchell Specialty Co.
Munning & Munning, Inc.
Norton Company
Philadelphia Mfg. Co.
Proctor Electric Company
Reynolds & Robson Supply Co.
Roxalin Flexible Lacquer Co.
Superior Steel Corp.
Minnesota Mining & Mfg. Co.
Harshaw Chemical Co.

The stated meeting on Friday, November 19, was well attended and resulted in the election of Mr. Harold Pelham, of the International Chemical Co. to associate membership as well as several new applications which were referred to the board of managers.

Owing to the inability of the speaker procured by Mr. Nelson to be present, a discussion of "Steel for Plating Purposes" was started and has aroused so much interest and requests for publication that you will find a short paper thereon enclosed with your reminder. This may be followed at a later date by another discussion on "Press Shop Methods to Lower Plating and Polishing Costs", if sufficient interest warrants.

So many requests have been received for publication of Mr. Overcash's talk on Bright Nickel, as given at our Reading Meeting in September, that we have sent the notes made to Mr. Overcash for editing and he has promised at his earliest opportunity to return them at which time they will be printed and distributed.

December 9 Dr. Blum will address the manufacturing plating firms and all others interested, on "The Value of Research to the Manufacturer", at Temple University.

Every plater should make a determined effort to have his president and as many officers of his company as possible present.

FREDERICK FULFORTH, *Vice-President* PHILADELPHIA BRANCH

ANNOUNCEMENT

The Hammond Machinery Builders, Kalamazoo, Michigan, announce the appointment of Mr. W. J. Bach, 1400 Tenth Pl., So., Birmingham, Ala. as their representative in the sale of Grinders for Foundry use.

Mr. Bach covers the states of Tennessee, Georgia, Alabama, Florida, Louisiana, N. Carolina, S. Carolina, and is well known in the Foundry trade.

This appointment is necessary due to the steady expansion of business and a widening of the Hammond Grinder Line which is resulting in an increasing interest in their products.

BRUCE PRODUCTS CORPORATION

Detroit **Howell**

It is our contention that we have gone a long way in the establishment of a definite scale for the measurement of the value of buffing compositions in the introduction of our new TRI-VAC Buffing Compositions. These products are all produced under pressure. A definite scale of density has been established, and this scale we have proven has a definite relationship to the adhesiveness, and therefore effectiveness, of the product in question. We know the resistance to fracture is greatly improved by the increased density. The buffing composition made by the old process, (pouring the melted material into a mould and cooling by air or water) permitted the entire structure of the bar to take on a looseness closely resembling a honey-combed effect, which has been referred to by the superintendent of one of the largest metal finishing establishments in this country, in his statement comparing Tripoli with TRI-VAC Buffing Composition, as "the gravel to the rock". He made further comparison of the crystals in the structure being forced into position instead of merely being piled on one another and permitting them to come to rest in any position, like so many matches being thrown helter skelter into a container instead of being placed neatly in a box of the proper size.

Tests were made of Tripoli and TRI-VAC to compare them as to density of structure and compressive strength. The tests and photographs were made under the personal supervision of Mr. DeGowin of the Detroit Testing Laboratory, 554 Bagley Avenue, Detroit, Michigan. The following figures show the results of the tests:

Density Measurements

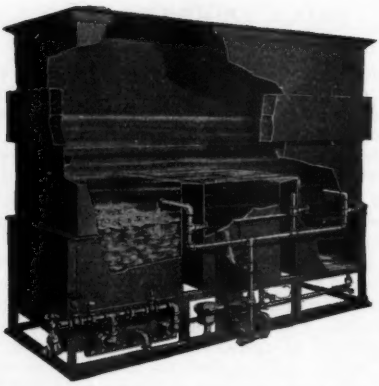
Density in Grams per Cu. In.		*Percentage of Improvement Over Old Compositions*
Tripoli	26.9	9%
TRI-VAC	29.5	
White Finish	30.7	7%
LI-VAC	33.1	

Compression Tests

Resistance to Fracture in Lbs. per Sq. In.		*Percentage of Improvement Over Old Compositions*
Tripoli	259.5	32%
TRI-VAC	343.0	
White Finish	933.5	24%
LI-VAC	1153.5	

The establishment of a definite scale for measuring the effectiveness of one buffing composition against another will eliminate the guess work and human element that has been one of the causes for the failure of this Industry to advance and to keep in step with other industries. The importance of buffing compositions has at last been recognized, and the establishment of TRI-VAC on an entirely different plane from the so-called tripoli, Nickel Coloring, Grease Stick days of the early "90's". You are no longer satisfied with the "horse and buggy day", nor its methods in any of your other departments. You can no longer be content with buffing compositions originated during the "horse and buggy days" and have never been changed. TRI-VAC changes all of this, and advances to its rightful place in the sun with other respective industries.

TRI-VAC Buffing Compositions cannot be made in a cement mixer and dumped into some cheap pans for cooling and hardening, but must be scientifically controlled while going through the new process made possible only by the use of our modern equipment.



THREE-DIP DETREX DEGREASER

For those departments where economical, efficient cleaning processes are desired, the Detroit Rex Products Company, 13005 Hillview Avenue, Detroit, Michigan, offers a three-dip hand-operated Detrex degreaser.

As can be seen from the cut-away illustration, the machine consists essentially of three chambers separated by wide dams which act as heat insulators. The chambers, from left to right, are designated as: the boiling chamber, the rinse chamber, the vapor chamber.

The arrangement of the three chambers permits a straight line sequence of cleaning operations. The work, which is placed in large perforated baskets, can be handled by hand or by means of a hoist, depending upon the weight of the load. The baskets, containing the work to be cleaned, are lowered into the boiling solvent in the first chamber where the heavy contamination is removed. The continuous sweep of the boiling solvent over the work gives a washing or scrubbing effect that assists in the removal of solid particles and caked-on materials. After immersion in the first chamber, the work is placed in the second or rinse chamber. The temperature of the solvent in this chamber is lower than that of the boiling chamber and that of the vapor chamber—the temperature difference being maintained by the open air space in the dam separating the chambers. Immersing the work in the cool rinse lowers its temperature and, at the same time, flushes off the work. A final cleaning, reheating, and drying are effected by placing the work in the third or vapor chamber. The work emerges from this chamber clean, warm, and dry—ready for subsequent operations. The entire cleaning cycle requires but a few minutes time at the most.

The water jacket and solvent collecting trough, which can be seen in the illustration, completely encircle the machine. The vapors, which condense at the level of the water jacket, are collected in the trough and returned to the rinse chamber. This arrangement insures a continuous supply of clean solvent condensate for rinsing the work.

The machine is equipped with a vapor actuated, air-operated control system, consisting of thermostat temperature indicator and valve, which is used to regulate the heat input, control the height of the vapor column, and insure maximum operating economy.

In order to maintain constant solvent levels in the various chambers, a motor-driven solvent transfer pump is used to return the overflow to the boiling chamber. This pump is also used for the transfer of solvent from any one chamber to any other chamber when cleaning the machine or distilling the solvent. It may also be used when filling the machine with solvent.

While the unit shown is arranged for steam heating of the solvent, models are available which employ gas or electric immersion heaters as the heating medium.

Overall dimensions of this unit are: 7′ 1″ long, 3′ 6″ wide, and 5′ 6″ high. The solvent capacity is 123 gal.

ANNOUNCEMENT

Hanson-Van Winkle-Munning Co., Matawan, N. J. and Anderson, Ind., is pleased to announce the appointment of The Chamberlain Co., Inc., 2550 E. Olympic Blvd., Los Angeles, Calif., as distributor for Hanson-VanWinkle-Munning Co. products in southern California. The Chamberlain Co. is carrying a complete stock of supplies for the plating industry.

Hanson-Van Winkle-Munning Co. is the oldest and largest organization in the metal finishing equipment and supply industry. The Chamberlain Co. was established in 1898 and has been in business continuously since that date. Jack D. Clayton, formerly representing the Hanson-Van Winkle-Munning Co. in Detroit, is acting as Sales Representative for The Chamberlain Co., Plating Supplies Division, in southern California.

Edward N. Boice

Edward N. Boice, treasurer of the Hanson-VanWinkle-Munning Company, Matawan, N. J., passed away Saturday evening, November 6, 1937.

Edward N. Boice was born on August 4, 1877. He first entered the employ of the Hanson and VanWinkle Company, then in Newark, N. J. in the Fall of 1892 as an office boy. He became bookkeeper in 1896 and held that post until about 1900, when he became purchasing agent and also continued as bookkeeper.

After the death of Abraham VanWinkle in 1915, Mr. Boice was given the post of treasurer of the Company which he held until the merger of the Hanson and VanWinkle Company with the A. P. Munning Company in 1927 to form the Hanson-VanWinkle-Munning Company.

Upon the formation of this combination, the largest organization in the history of the electroplating equipment and supply industry, Mr. Boice was made secretary and also served as sales manager for a short time. He continued in the position of secretary until 1930 when he was made treasurer which position he held up to the time of his death.

Mr. Boice was nationally known throughout the industry. He had friends in every place where electroplating is practiced. His kindly, genial personality made him welcome everywhere. He was very active in the old Metal Finishers Equipment Association for a number of years.

Mr. Boice was a member of the Kane Lodge of Masons in Newark, N. J. He is survived by his wife, mother, sister and three brothers.

Mrs. Frederick Gumm

We were sorry to learn of the death of Mrs. Frederick Gumm, wife of Frederick Gumm, of Newark Branch.

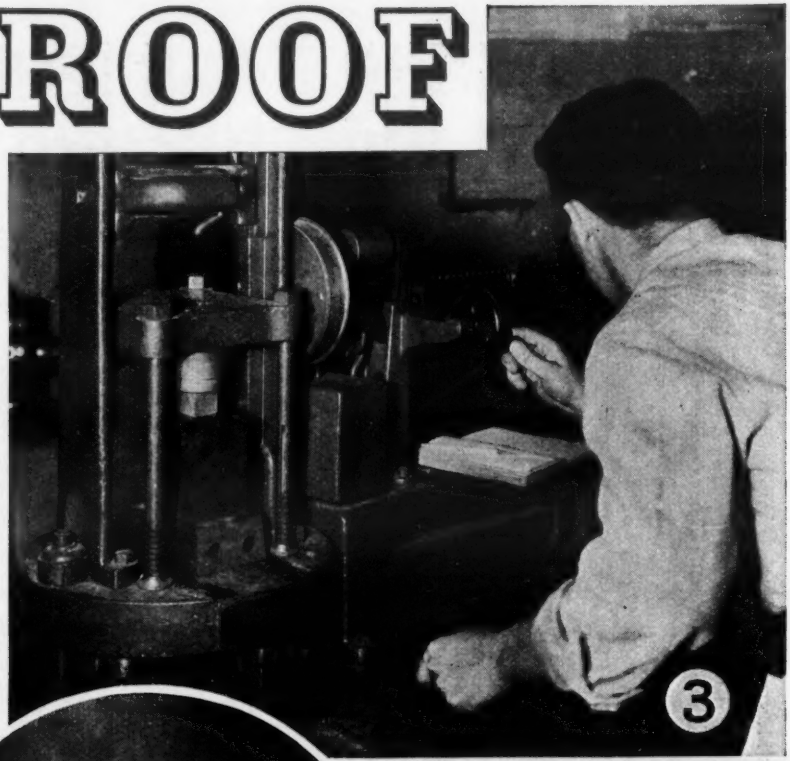
We express our sympathy to the members of the family in their time of sorrow.

Here's PROOF

If seeing is believing—then we are sure that you will agree with us that TRI-VAC is more Dense, more Adhesive, and more Efficient.

These unretouched photographs were taken at the Detroit Testing Laboratory under the personal supervision of Mr. DeGowin, who made the density and compression tests of TRI-VAC as compared with the same tests of Tripoli.

1. A square of TRI-VAC and Tripoli were weighed for density compression. **2.** Each piece was measured with a micrometer. **3.** Engineer adjusts compression machine for testing. **4.** Close-up of the compression test of a sample of TRI-VAC.



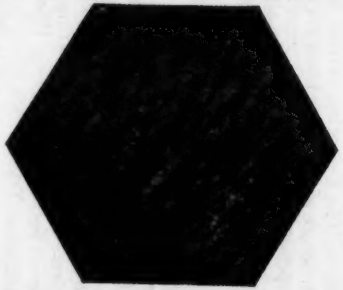
DENSITY MEASUREMENTS

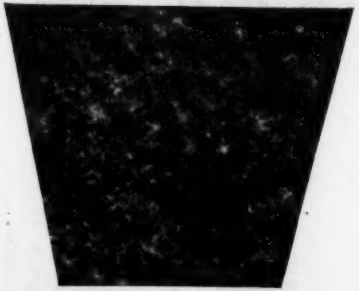
MARK		DENSITY GRAMS/CU. IN.
TRIPOLI	No. 0	26.8
TRIPOLI	No. 1	27.0
TRI-VAC	No. 2	29.4
TRI-VAC	No. 3	29.5

COMPRESSION TESTS

MARK		COMPRESSIVE STRENGTH IN LBS.
TRIPOLI	No. 0	264
TRIPOLI	No. 1	255
TRI-VAC	No. 2	307
TRI-VAC	No. 3	379

Here are two photographs of fractured sections of TRI-VAC and Tripoli that have been enlarged five times to show how





they compare in structure. Note the voids and air-pockets in the Tripoli as compared with the density of structure in TRI-VAC.

All patents applied for. This advertisement was approved by the Detroit Testing Laboratory, 554 Bagley Avenue, Detroit, Michigan

BRUCE PRODUCTS CORPORATION

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DAYTON BRANCH

The November meeting of the Dayton Branch was held at the Engineers Club on Friday, November 5th.

A letter from Mr. Fletcher concerning the Branch exhibits of plated ware at the 1938 Convention was read and a committee appointed to see that Dayton is well represented. The members of this committee are: Mr. George Speakman, Mr. Vivian Garrison, Mr. H. C. Luchauer.

Action was taken on a letter from Mr. Sheehan asking the Branch to present a paper at the 1938 Convention. Dr. Berner and Mr. Maeder were appointed to decide on the method of presenting this paper and their report will be heard at our next meeting.

A membership committee was appointed to bring out some of our old members and get more of the eligible men in this vicinity into the organization. The members on this committee are: Mr. Farber, Mr. Cusick, Mr. Harter.

Our President, Mr. Conley, announced a class in Polishing and plating for the next four months.

Mr. Conley will teach this class which is sponsored by the Dayton Foremen's Club and he invited all who are interested to attend.

At this time Mr. Conley introduced our speaker Mr. Stadel of the McGean Chemical Company. His subject was "The Plating of Zinc Base Die Castings."

Mr. Stadel stressed the fact that the casting itself and its preparation prior to plating was important in the successful plating of die castings.

He advised a Rochelle Salts copper solution with a plate of at least .0003 before nickel. This is important since a thinner plate will alloy with the zinc and cause trouble.

The use of a low pH Nickel Bath and high current density (40-60 amps. per square foot) was recommended.

Mr. Stadel then introduced Mr. Savage who gave a short discussion of polarized and carbon type anodes and their care.

The question period at the close of these talks brought out many things especially in the care and use of Rochelle Salts Copper, that were much appreciated by the members and visitors.

At the conclusion of their talks Mr. Stadel and Mr. Savage were given a unanimous vote of thanks.

Three applications were received and will take the usual course.

An announcement was made of the First Educational Session and Banquet to be given by the Detroit Branch on December 4th.

The meeting was adjourned until Tuesday, December 7th, when we will have Dr. Blum as speaker.

CORLISS W. POWELL, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch A.E.S., was held on Friday evening, November 5, 1937, at the Krueger Club, Belmont and Springfield Aves., Newark, N. J. The meeting was called to order at 8:30 p.m. by Mr. Philip Sievering who was appointed President *pro tem* due to the absence of our President and Vice-President. Officers present were: George Wagner,

Secretary; Nelson Sievering, Treasurer; Paul Oldam, Librarian; Roy Stout, Sargeant-at-Arms; Thomas Haddow and Samuel Glickenhaus, Trustees.

The minutes of the previous meeting were read and approved.

Communications from the Milwaukee Branch of the A.E.S. and from Mr. Austin Fletcher, Chairman of the Exhibits Committee for the Milwaukee Convention were read and turned over to our Librarian for action.

A bill for the Second Quarter Per Capita Tax and one for the printing of the 1937-1938 Educational Program Booklet were presented and voted to be paid.

Applications for Mr. William F. Newbery of the Detroit Rex Products Co., to Associate Membership and Mr. Michael Sahagio to Active Membership were voted to take the regular course.

Mr. Harmon S. Hunt was elected to Associate Membership.

Our Librarian, Mr. Oldam, had arranged for two very interesting speakers for the evening. The first of the two speakers was Mr. Thomas H. Chamberlain, Director of Research Laboratory, New Haven Clock Co., New Haven, Conn. His subject was "Gold Plating and the Effect of Heat Treatment on Heavy Deposits." His talk was very interesting especially to the gold platers of the branch. The papers and the discussion will be printed in the MONTHLY REVIEW in detail at some future period.

The other speaker was Mr. Walter R. Meyer, Electro Chemist, General Electric Co., Bridgeport, Conn. His subject was "Trouble Shooting in Electroplating." His talk was accompanied by Stereopticon Pictures. Mr. Meyer explained with each picture how trouble started on some particular plated article and what caused the defects in the deposit. He showed us humps and bumps, cracks and pits, and explained how they could be traced to a very definite cause.

Mr. Meyer and Mr. Chamberlain were given a rising vote of thanks by the 86 members and visitors who attended this meeting.

Meeting adjourned at 11 p.m. and was followed with refreshments, served in the good old fashioned way.

GEORGE WAGNER, *Sec.*

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CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held November 13, 1937, at the Atlantic Hotel.

President E. Stepka presided and all other officers were present.

Mr. W. A. Burke was elected to associate membership, and Mr. J. E. Morgan was elected to active member-

ship. Mr. R. Harr transferred from Detroit Branch to Chicago Branch.

Mr. O. E. Servis, the librarian, found the following questions in the question box:

No. 1. *What causes nickel to peel in spots* $\frac{1}{4}''$ *in diameter on round balls one inch in diameter, plated in a bbl, solution* 4 *oz. metal,* 4 *oz. boric acid, pH* 6.0; *about* 10% *of production peels in this manner?*

Ans. As this question does not mention chloride in this solution it was suggested to add some, lower the pH and most important to clean the work better before plating.

No. 2. *I just made a* 14 *K. aurosal gold solution, the first load of work turned out fine, then the color changed toward a darker red. The temperature is* 140° *and the current is* 2 *volts.*

Ans. It was suggested that an addition of cyanide might help.

No. 3. *What may cause pitting in a brass solution?*

Ans. After a short discussion it was found in this case that the work had not been properly cleaned.

No. 4. *Is rosin a good brightener for a tin solution?*

Ans. The rosin was not used as a brightener but does help hold down the fumes.

No. 5. *Can sodium hyposulphite be used in a bright zinc solution without harm to the bath?*

Ans. It will not be harmful to the bath in small quantities.

No. 7. *Why is caustic soda used in a brass solution? How much is used?*

Ans. This question caused a lot of discussion but no real answer can be given unless it was known just what was wanted, color, adhesion, or pH.

J. W. HANLON, *Sec.*

BRIDGEPORT BRANCH

The regular monthly meeting of the Bridgeport Branch was held on Friday evening November 5, in the Chamber of Commerce Rooms of the Stratfield Hotel. Joe Sterling, President, called the meeting to order.

The roll call of officers and the minutes of the last meeting were read and accepted.

The Sick Committee reported that Mrs. Stratton was very much improved.

A communication from the Third Vice-President Austin Fletcher was read and will be taken up at the December meeting.

A communication from Vincent Sheehan of the Education Committee of the Milwaukee Branch asking for papers from the local Branch was turned over to the Librarian. A communication from the Detroit Branch was read and placed on file.

The transfer of Mr. David Williard from the Bridgeport Branch to the Detroit Branch was read and granted.

Applications of Henry Zucker and Steve Pribesh were read and turned over to the Board of Managers.

Commencing with December, all meetings will be called to order, promptly at 8 p.m.

All bills against the Branch were ordered paid.

For the good of the order: Joe Sterling told of the good results he had in the bright nickel plating of parts which he re-racked and placed in chromium bath without coloring, and 100% results in chromium plating screws in baskets. Comments were made on cleaning parts before nickel plating them by John English, Wm. Thompson, Elmer Munson, Kenneth Kusterer. Mr. McElroy asked questions on gold chloride solutions which

were answered by Herman Braun and Joe Sterling.

Recently some local members attended a most interesting meeting of the New Haven Branch when they heard talks on the Rochelle Solution.

The Treasurer's report was read and accepted.

Meeting adjourned.

WILLIAM FLAHERTY, *Sec.-Treas.*

WATERBURY BRANCH

On Saturday afternoon and evening, November 6, 1937, the first educational session and banquet was held by our Branch at the Hotel Elton, Waterbury.

The speakers at the afternoon session were: Walter R. Meyer, who spoke on "Electro-plating Practice in Europe", J. B. Charlson, who spoke on "Plating of Die Castings", and Dr. Edlin, who spoke on "Electro Chemistry as Applied to Medicine". The session was well attended and many questions were asked of all of the speakers. Dr. Edlin gave a demonstration of the effects that electric current may have on the various muscles of the body which was instructive as well as humorous when demonstrated on a live model.

In the evening 151 people attended the banquet, followed by entertainment and dancing. We were glad to have Mr. Kennedy, Supreme Secretary, with us, as well as Mr. George Hogaboom, who presided at the afternoon session, and Mr. Horace Smith from the Newark Branch.

Two applications for membership were received from Joseph Petrocelli, and William Moriarity.

A report of the banquet was made and it was announced that the banquet was not only a success from an educational and social standpoint, but also from a financial standpoint, which was very gratifying for the first affair of this kind.

It was announced that at the December meeting we will have Dr. Wm. Blum of the National Bureau of Standards to talk on the "Value of Electro-plating Researches to the Executive." All members of nearby Branches are invited to attend as well as any other people who are interested in this subject.

E. T. CANDEE, *Sec.-Treas.*

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ROCHESTER BRANCH

The Rochester Branch held its October meeting as a dinner meeting at the Rochester Leiderkranz Club. The meeting was very well attended and after a very excellent meal a short business session was held after which the meeting was turned over to Mr. Frank Kolb, who introduced the guest speaker of the evening. Dr. Webb is a Research Associate in the Research Laboratories of the Bausch and Lomb Optical Co. in Rochester. His topic was "Wetting Agents" and he held his audience's attention for a very interesting talk. The whole talk will be sent on for future publication in the MONTHLY REVIEW. Come again some time, Dr. Webb, with some more

of the same. We sure can use it. After the talk a rising vote of thanks was extended to Dr. Webb, and then the meeting was adjourned.

JUDSON R. ELSTER, *Sec.*

CLEVELAND BRANCH

The regular monthly meeting of the Cleveland Branch of the American Electro-Platers' Society was held on Saturday, November 6, at Hotel Cleveland.

The meeting was called to order by our President, Mr. Wm. D. Scott, at 8:30 p.m.

The minutes were approved as read.

The general business was carried on and the meeting adjourned at 9:00 p.m.

Mr. Hull of Grasselli Chemical Co. gave a very interesting talk on Bright Zinc Plating.

Mr. Hull brought a slide projector and a small plating unit which worked very good. Three copper plates were plated and after each one was plated another form of brightener was added. This was to show the value of their plating process "Zinolite". He then showed the slide on the necessity of heat control.

The next speaker will be from the Hanson-VanWinkle-Munning Co. Dec. 4. This will be an open meeting to every one interested in plating.

Mr. Martin Horvath, Jr., of Vlchek Tool Co., applied for active membership in the Cleveland Branch.

Mr. Fred Luzuis, 3704 West 130th St., Cleveland, Ohio, suspended.

CHARLES F. OTT, *Sec.-Treas.*

HARTFORD BRANCH

The Hartford Branch of the A.E.S. held its regular monthly meeting on Monday evening, November 15, 1937, at the State Trade School, 110 Washington St., Hartford, Conn.

The meeting was called to order at 8:30, with President Pietro in the chair. Minutes of the previous meeting were read and accepted. All communications were read, one letter being tabled to the December meeting. A committee of three, consisting of Mr. Jos. Beloin, Mr. Jos. St. Pierre and Mr. A. N. Austin, was appointed to bring in a report relative to a branch paper to be presented at the 1938 Convention. One bill for our second quarter per capita tax was voted paid.

Mr. Geo. B. Hogaboom, electroplating engineer of the Hanson-Van Winkle-Munning Co., of Matawan, N. J., gave a very fine talk, accompanied with lantern slides, on "The pH of Alkaline Plating Solutions." The talk was not only very interesting, but also very instructive, and caused quite some discussion which was also helpful.

Mr. Hogaboom was given a rising vote of thanks for his very fine talk.

Among the forty-odd members and visitors present, was our Supreme Secretary, Mr. Kennedy, who spoke a few welcome words to those present. It was with much interest that we heard of the formation of another new branch of the A.E.S. The new one being Buffalo Branch.

The meeting was adjourned at 10:45.

V. E. GRANT, *Sec.*

LOS ANGELES BRANCH

Minutes of the regular monthly meeting of the Los Angeles Branch of the American Electro-Platers' Society held November tenth at the Rosslyn Hotel. President John L. Merigold presided. 24 members and 5 visitors were present. Minutes and financial report of the previous meeting were read and accepted.

Mr. F. A. Maurer, Chemist of General Electric Co. at Ontario, Calif.,

devoted one hour and fifteen minutes to the first of a series of lectures on the Educational Hour. The topics discussed were: 1. The Simple principles of Chemistry; 2. Principles of Electricity; 3. Principles of Electroplating; 4. Chemistry of Various Plating Solutions.

Mr. Maurer has the ability to present his talks in words understood by all, which makes them doubly interesting. Appreciation was shown by the applause he received.

The meeting adjourned at eleven p.m.

RAYMOND SOLIVAN, *Sec.-Treas.*

MILWAUKEE BRANCH

At the November meeting of the Milwaukee Branch we were hosts to several Chicago Branch members and one of the men, Mr. W. L. Pinner of the General Spring and Bumper Co., gave us an illustrated talk on "Methods of Checking Plated Coatings." We want to take this opportunity to thank Mr. Pinner for his efforts and assure him that we enjoyed the evening. He showed us very clearly that wide discrepancies can occur in checking a plated article unless the operator is well aware of the errors that can creep into his work. An interesting sidelight developed in regard to anode behavior in a nickel solution. Mr. Pinner and his associates have gone quite thoroughly into anode corrosion and he assured us that a paper will be delivered at the 1938 Convention which will clear this matter up a great deal.

Mr. Oscar B. Moe, associate, and Irving M. Herrmann, active, were elected into membership.

The various committees on the 1938 program are rapidly shaping into well-ordered groups.

A. J. HERMANSEN, *Sec.*

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BINGHAMTON-ELMIRA BRANCH

The regular meeting of Binghamton-Elmira Branch was held Monday, November 15 at the Y. M. C. A. The speaker of the evening being Mr. Frank C. Mesle of Oneida Ltd., Oneida, N. Y. Mr. Mesle spoke on plating to specification and measuring the thickness of plated coatings. He also brought along the block for using the Chord Method and demonstrated its use and the method of reading the cut made by the file. He also had along with him many samples demonstrating the distribution of the metal over spoons, etc., and the adhesion of plated coatings to the base metal. We all enjoyed and appreciated having Mr. Mesle.

While plans for the December meeting have not been completed as yet, the January meeting which will be held Monday, January 10, promises to be very interesting. This meeting will be held at 2 p.m. at Sherill, N. Y., at the plant of Oneida, Ltd. Mr. Mesle, Mr. Thurber, and Mr. MacDonald will conduct a tour through the plant. After the plant visitation, Mr. Thurber, chemist in charge of the laboratory at Oneida, Ltd., will speak at the dinner

meeting to be held at the plant dining room.

Reservations for the trip and dinner will positively have to be made before the meeting. Members of other branches are welcome to attend.

AUSTIN FLETCHER, *Sec.*

PITTSBURGH BRANCH

At our meeting of November 9th, which was held after a dinner in Hotel Webster Hall, action was taken on the application of Mr. Frank R. Keller, 815 Feree Street, Coraopolis, Pa., who was duly elected to active membership.

We are meeting on different nights in order to see if we cannot boost our attendance, but do not know what effect it will have, if any. Our next meeting will be held in the Bureau of Mines, Wednesday night, December 8th.

S. E. HEDDEN, *Sec.-Treas.*

BOSTON BRANCH

Boston Branch met Thursday, Nov. 18th, at the Manger Hotel, with President Mintie in the chair.

Minutes of the previous meeting read and approved, bills, and communications read and placed on file.

The Stag Party Committee made a report that everything is going along fine and have a great time in store for those who attend.

Report of the banquet committee was made as one of progress and that it will be the best time ever held by the Branch. Bert Sage reported that he has made arrangements for another great educational session better than last year; he also spoke on the work being done by the Research Committee and asks every member to help to put the banquet over in a bigger and better way than last year.

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One application was read for the second time and elected to membership —Joseph T. Montgomery, 24 Dane Ave., Somerville, Mass., Associate.

Two applications were read for the first time and turned over to the Board of Managers as follows: Robert R. Flaherty, 47 Sacramento Street, Cambridge, Mass., Associate, and Robert Andris, 74 Sunnyside Street, Hyde Park, Mass., Associate.

Boston Branch accepted the transfer of W. K. Schochley of Cleveland Branch as an active member.

The Branch has arranged to present a paper at the next Convention.

A letter was read from the Manger Hotel stating that the rates for meeting rooms would be increased to take effect Nov. 15th. After much discussion, a motion was made that the Secretary be instructed to look for new quarters, so that hereafter the Branch will meet the first and third Thursdays of each month beginning Dec. 2d at the Bradford Hotel, Tremont Street, Boston.

This being assistant foreman's night the librarian presented Edmund Jeveli, one of our new members. His talk was on the pH of copper rochelle salts solution. This paper is published in this issue of the REVIEW. He gave a very

fine talk and answered all questions for the members followed by a general discussion of the members for over an hour.

We had with us one of our best friends, Dr. Klinkenstein, who is always welcome to our meetings.

Meeting adjourned at 11 p.m.

A. W. GARRETT, *Sec.*

ROCHESTER BRANCH

The Rochester Branch held its regular November meeting as a dinner meeting at the Rochester Liederkranz Club. After the dinner a short business session was held. The letter from Mr. Vincent Sheehan in regard to a branch paper for the convention was read and it was decided that the branch will not present a paper. The letter from Mr. Austin Fletcher in regard to a committee to arrange for a branch exhibit was considered and Mr. Christian Boehm was appointed chairman of this committee. A number of applications were read and ordered published. Motion was made by Mr. Desmond, seconded by Mr. Gartland, to arrange for an annual meeting as soon as possible. Carried. President Kohlmeier delayed naming of committee until after Board of Managers' meeting. All bills were ordered paid. The business session was then adjourned and the speaker of the evening, Mr. G. A. Lux, Chief Chemist of the General Railway Signal Co., was introduced by President Kohlmeier. His topic was "A Brief Description of Paints, Varnishes, Enamels and Lacquers." His subject was one that was very interesting to all present and at the completion he was kept busy answering questions for some time. He was then given a rising vote of thanks for a very interesting talk.

JUDSON R. ELSTER, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch A.E.S., was held on Friday evening, November 19, at the Krueger Club, Belmont and Springfield Aves., Newark, N. J.

Due to the late arrival of our President George Klink, the meeting was called to order at 8:30 P.M. by our Vice-President William Hodecker, Sr. Other officers present were: George Wagner, Secretary; Nelson Sievering, Treasurer; Roy Stout, Sarg-at-arms; and Samuel Glickenhaus, Trustee.

The minutes of the previous meeting were read and approved.

Communication from Mr. Austin Fletcher regarding the 1938 Branch Exhibit for the Convention was read and Mr. Paul Oldam was appointed chairman of that committee.

Applications for Mr. Joseph M. Klein, Jr; 20 Albany Ave., Nutley, N.J. and Mr. Meyer Roter; 48 N. Hermitage Ave., Trenton, N. J. to active membership were voted to take the regular course.

Mr. Horace H. Smith, General Chairman of the 1939 Convention, reported that he was gradually getting his committees appointed and that after the first of the year he would call a committee meeting for the purpose of commencing work on the '39 Convention. Mr. George B. Hogaboom informed us that 1939 would be the 100th Anniversary of the Electro Plating Industry and therefor it should be the biggest and best Convention ever held.

The speaker for the evening was Mr. G. Byron Hogaboom, Consultant in Electroplating and Metal Finishing, Newark, N. J. His subject was "Purification of Nickel Plating Solutions." Copy of his paper will be published in the MONTHLY REIVEW.

Mr. Hogaboom was given a rising

vote of thanks by the 42 members present. Meeting adjourned at 11 P. M.

GEORGE WAGNER, *Sec.*

ANDERSON BRANCH

The regular November meeting of the Anderson Branch American Electro-Platers' Society was held Wednesday, November 17, at the Y. M. C. A. with George Onksen, Sr., presiding.

The roll call of officers was read with all present.

The minutes of the last meeting were accepted and approved.

G. M. Cole was appointed chairman of the Exhibit Committee to represent the local Branch at the National Convention at Milwaukee next June. Mr. Cole will announce his committee at the next regular meeting.

A committee composed of Messrs. Wagner, Cole, and Minton were appointed to consider the writing of a group paper by the Branch to be presented at the next National Convention in Milwaukee. Report of this committee is to be made at the next regular meeting.

Treasurer's report for first quarter 1937-38 was made and duly accepted by the Branch.

Favorable action taken on all bills and ordered paid.

Meeting adjourned at 9:45 p.m.

R. PHILLIPS, *Sec.*

GRAND RAPIDS BRANCH

The regular meeting of the Grand Rapids Branch of the American Electro-Platers' Society was held in the Y. M. C. A. Nov. 11. In spite of Armistice Day being a poor night for a meeting, we had a good turn-out.

Mr. Homer Morton brought with him a display of furniture trimmings manufactured by the Keelar Brass Co. The collection was particularly interesting to the members since it showed the application of plastic to that line of goods. Many articles that formerly were of metal (generally plated) are now made of tenite, lucite, lumarith, catalin, Bakelite, or some other plastic so it is no wonder that the plater is interested.

It seems that even the stainless steel is, in a way, a menace to the plater; he is often asked to plate over it for some reason or other generally a matter of color.

The plating of stainless steel is largely a matter of pickling, different types requiring different methods of pickling.

The subject of plating on wood was brought up but it was agreed that there is little call for it.

Very few people are doing it because in most cases the article can be fabricated of metal (cast, sheet, tube, rod,

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etc.) and plated cheaper than using wood and the more elaborate plating method required for the latter.

Several of the members expressed their intention of attending the big educational session and dinner given by the Detroit Branch Dec. 4th.

All A.E.S. members especially in the vicinity of Detroit, should be interested.

Members discussed activities for the winter to hold interest, increase attendance, and draw new members.

CHAS. S. WHALLEY, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch A.E.S. was held on Friday evening, December 3, at the Krueger Club, Belmont and Springfield Aves., Newark, N. J.

The meeting was called to order at 8:30 p.m. with President George Klink presiding. Other officers present were: George Wagner, Secretary; Nelson Sievering, Treasurer; Paul Oldam, Librarian; Roy Stout, Sargeant-at-Arms and Samuel Glickenhaus, Trustee.

The regular routine of business was dispensed with as we had two very interesting speakers on our program for the evening. After applications for Mr. Benson Leister and Mr. John R. Gumm were voted on and both elected to Associate Membership, Mr. George Wagner was appointed Chairman of the Banquet Committee. Educational Session and Banquet to be held on April 23, 1938 at the Hotel Douglas.

The meeting was then turned over to our Librarian, Mr. Oldam, who introduced Mr. Albert Hirsh as the first speaker of the evening. His subject was "The Effect of Free Sodium Cyanide, Sodium Carbonate, and Rochelle Salts on the Cathode Efficiency of a Cyanide Copper Solution." His talk was accompanied by stereographs which showed all the tests and calculations made by the speaker on numerous experiments. Mr. Hirsh's talk caused quite a sensation in arguments and discussions between George Gehling, Lewis Graham, Philip Sievering, Dr. Mantell and the speaker. Abstracts from his paper will be published in the REVIEW at some future date.

The next speaker was DR. C. L. Mantell, whose subject was, "New Competitors for Electroplated Finishes." Dr. Mantell's talk was more in the form of a lecture and was also very interesting. He urged the members to do better work and produce work according to specifications where specifications are required. He informed us that a certain company had sent out samples with specifications to different plating concerns and when these samples were returned they were anything but the specifications required. He also informed us how markets were created for different metals, how these metals were being used up entirely so as not to have any returns from scrap and thereby the demands for the metal would have to be supplied from virgin metal. Also how the supplies were being exhausted and the prices would rise to a prohibitive stage. This condition usually starts the engineers working and looking for substitutes which very often prove superior to the original metal used.

Mr. Hirsh and Dr. Mantell were given a rising vote of thanks by the 54 members and visitors present. Meeting adjourned at 11:00 p.m. and was followed with refreshments.

GEORGE WAGNER, *Sec.*

DETROIT BRANCH

Questions and Answers of November Meeting,

Q. Do all metallic impurities decrease corrosion resistance?

A. Metals of high purity are less *soluble* than impure metals, but certain alloy plates have been shown to possess good protective qualities on steel.

Q. What current efficiencies can be obtained in a Rochelle Salt copper bath at 150° to 170° F. at various current densities?

A. Not much difference is reported between Rochelle Salt and simple cyanide copper under comparable conditions. That is, cathode efficiency falls off rapidly with increased current density. Free cyanide concentration has more effect on efficiency than Rochelle Salt.

Q. What would cause spots on steel, plated in bright nickel bath? Spots can be buffed out, adhesion of nickel excellent. These spots are just a shade duller than the bright nickel.

A. Possibly due to insufficient rinsing and neutralization of alkaline film from copper strike.

Q. What causes a rough, hard chrome plate on steel? Temperature of bath 140°F.; current density 300 A/□′; ratio 100 to 1. Chromic acid 40 oz/gal.

A. Best results in hard chrome plating are obtained with a 33 oz. bath at 130°F.; 250 A/□′; ratio 100 to 1. After a year's operation it is advisable to replace the bath.

Q. What acid, and what concentration of this acid, and what time of exposure is recommended for the etching of zinc base die castings prior to copper-nickel-chrome plating, in preparation for subsequent baking of enamel at 200 to 225°F.?

A. Hydrofluoric acid, 2 to 3%, 2 or 3 seconds, is recommended. In order to use this successfully, it is advisable to keep the time in the cleaner at a minimum — preferably 5 to 10 seconds. A rubber tank is recommended for the acid.

Q. What would cause blue chrome with a 54 oz. solution? Temperature 118°; ratio 100 to 1.

A. Low current density.

Q. How does tin plate compare with zinc in protection factors and costs?

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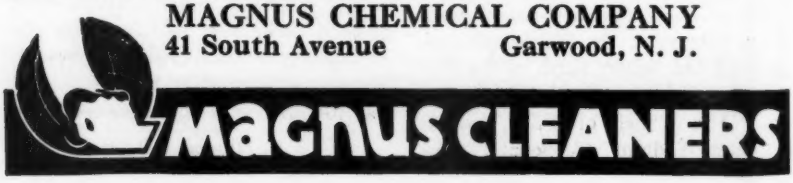

A. Tin is more costly and gives less protection than zinc, comparing equal thicknesses.

Q. What is meant by the term "Triple chrome plate" in advertising copy?

A. Probably the parts were stripped twice.

Q. Are operating costs greater for cadmium than zinc?

A. Considering the cost of brightener zinc is probably equal or greater than cadmium for high luster plating.

Q. Is there available a reliable, quick method of analyzing a copper bath for Rochelle Salt?

A. No.

Q. At what temperature should paint be baked on chrome plated die castings?

A. 200°F. or lower. See question on preparation of die castings for plating and enameling.

Q. How may impurities be removed from a cyanide zinc plating bath?

A. By running at low current density on "dummy" cathodes with steel anodes.

Q. What is a simple way of determining the surface area of intricately shaped articles?

A. No method is known.

Q. What is the most satisfactory voltage to use when plating from a zinc cyanide plating solution? Temperature 80-95°F., no agitation.

A. On still tanks, 3 to 6 volts.

B. F. LEWIS, *Acting Librarian.*
T. C. EICHSTAEDT, *Sec.-Treas.*

BOSTON BRANCH

Boston Branch met Thursday, December 2nd at the Bradford Hotel with President Mintie in the chair.

Minutes of the previous meeting were read and approved, communications read and placed on file, bills read and moved that they be paid.

Report on the educational session of the banquet was made by Chairman Sage and he says that it will be the best that the Branch has ever held, his plans are now complete.

A report was also made by Joe Barron on the banquet and he says that the plans of the committee are going along fine and that this should be the greatest banquet that the Branch has ever held. He has also planned to take care of the ladies in the afternoon the same way as last time, so don't forget to bring the ladies, they will be given a great time. He also asks every member to give all the support they can to the committee.

A motion was made that a committee be appointed to rewrite the amendment that was presented to the last convention and that it be presented to the next convention.

Two applications were read for the second time and elected to membership as follows: Robert R. Flaherty, 47 Sacramento Street, Cambridge, Mass.; and Robert Andris, 74 Sunnyside Street, Hyde Park, Mass. The transfer of W. K. Schochley, of Cleveland Branch was accepted by the Branch.

Some of the members will attend the meeting of Providence Branch December 17th.

We had as the speaker for this meeting Dr. Wilson of the Zialite Corp. He was introduced by the librarian, Bert Sage; his talk was "Bright Copper Plating." He gave a practical demonstration of this bright copper plating before the members and after this invited the members to come up and plate some of the samples he had with him. It was a very fine demonstration, and he answered all questions for the members as best he could as this is a patented solution. Dr. Wilson

was given a rising vote of thanks for his fine talk.

The meeting adjourned at 10:30 p.m.

A. W. GARRETT, *Sec.*

BALTIMORE-WASHINGTON BRANCH

The next meeting of the Baltimore-Washington Branch, A.E.S., will be held at the National Bureau of Standards in Washington on Saturday, December 4th at 7 p.m.

The educational program for this meeting will be a round table discussion on:

"Some Practical Problems of Nickel Plating."

Mr. Arthur G. Pierdon will act as leader of the discussion. The speakers will be: P. A. Lower, Charles Kasper, W. M. Gibson, John Binns, R. S. Gregg.

Every member who was fortunate enough to attend the November meeting, were unanimous in voicing the opinion that it was one of our best meetings, therefore, the officers of our Branch hope you will cooperate with Mr. Fred Pierdon and the Educational Committee in their extended efforts this year to make each meeting more interesting, thereby bringing out more members who are interested in improving their knowledge of electroplating.

Refreshments will be served at the close of the meeting.

IRVIN H. HAHN, *Sec.*

NEW YORK BRANCH

The New York Branch resumed their bi-monthly and educational meetings during the month of November at their headquarters in the Hotel Pennsylvania.

However, before their Fall and Winter program of activities was begun the Branch voted to tender a testimonial dinner to the members of the Silver Jubilee Convention Committee on Saturday evening, November 6th, also at the Pennsylvania Hotel. The officers and old time members of the Branch were present with the members of the Convention Committee itself. The Branch took the opportunity at this time to present a token of esteem and appreciation to the members of the Convention Committee for their effort in promoting the Silver Jubilee. President Liguori acted as toastmaster and made the presentations but turned over the job of presenting Tom Trumbour of the Metal Industry and a hard worker of the New York Committee with several golf rods, to the chairman of the Convention Committee, F. J. MacStoker. Mr. Liguori was tired of hearing Tom alibi his rotten golfing performances and asked Mac to take this means of providing against it.

The first regular meeting of the Branch, Friday, November 12th, was a business session, followed by an interesting and fullsome use of the old Question Box. There were discussions on various problems until 11:15 p.m.

The second meeting, Friday, November 26th, was an open meeting, the first of several New York proposes to hold during the Winter and was featured by a lecture by Dr. C. B. F.

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Wilfred S. McKeon, President.

Young, electro-metallurgist, an instructor on the staff of Columbia University, Division of Electro-Plating Education and a member of the New York Branch. Dr. Young had for his subject of the evening "The Corrosion of Iron and Steel from the Electro-Platers' Viewpoint", Dr. Young lectured and answered questions for an hour and a half. The interest on the part of many engaged in nickel and chrome plating iron and steel was manifested by the discussion. There were eighty-five in attendance on this occasion. Dr. Young was extended a rising vote of thanks for his interesting discourse. President Liguori of the Branch called upon Vice-President Franklyn J. MacStoker of the A.E.S. for a few remarks. Mr. MacStoker responded with an appeal to the platers of the Metropolitan Area to take advantage of the opportunities extended through membership in the A.E.S. and invited all eligible to come in and interest themselves in this connection. The meeting adjourned at 10:30 p.m., after which many present renewed old acquaintances and talked of things of common interest.

HENRY A. PAINTER, *Sec.*

MONTREAL BRANCH

Montreal Branch has changed its meeting night from the second nad fourth of each month to the last Thursday. This seems to meet the convenience of most of the members as there was a greatly increased attendance at the meeting held Thursday, November 25th, at the New Carlton Hotel. President L. Lariviere called the meeting to order. Other officers present were: R. Gordon, vice-president; John Cronin, secretary; F. Green, D. McMullins, John Feeley, C. Doherty. Letters regarding available speakers and the action taken since last meeting were reported on by the secretary. A discussion at some considerable length followed on the circumstances attending inviting speakers from the U. S. to Canada.

Information was asked on how to brass plate zinc base cast floor lamp bases?

Ans. Use a new boiling hot commercial cleaning solution, dip only long enough to get a white film on the work, a matter of only a few seconds, rinse in clean cold water and place in brass plating tank. The new cleaner solution being necessary to avoid the deposition of any metal that may be present in an old solution on the work.

There will be no meeting of this Branch in December. The next meeting will be the last Thursday of January.

J. T. CRONIN, *Sec.*

ST. LOUIS BRANCH

Regular meeting of the St. Louis Branch A.E.S. was held Friday, December 3, 1937, at the Central Y. M. C. A. Dinner was served at 6:15 P. M.

In the absence of President Al Barth, Vice-President called the meeting to order.

Letter was read from the Milwaukee Branch asking for paper to be presented to the Convention to be held there next year.

Mr. Musick, Chairman of the Banquet Committee, reported the banquet would be held January 22, 1938, at York Hotel; price $2.00 per plate. Mr. B. Daw, appointed Chairman of the afternoon session, and you can look for some good speakers. They will also have a question box. The meeting is to start on time, 3:00 P. M. Mr. Daw left after the meeting for the Detroit banquet.

Mr. D. Crane attended the meeting and gave us some information on what is going on around the country.

Missed some of the old time members, and hope they will be with us in the near future.

Do not forget the St. Louis Banquet, January 22, 1938; afternoon session starting at 3:00 P. M., Mr. B. Daw, Chairman.

Meeting adjourned to meet at the call of the President.

C. T. McGINLEY, *Sec.*

PROVIDENCE-ATTLEBORO BRANCH

Regular meeting held at Narragansett Hotel, Friday November 19th. Dr. K. Schumpelt was the speaker and his topic was: "A Critical Study of Alloyed Plating Solutions". Using a black-board, the Dr. illustrated graphically, as he talked, the results of his research, working with an 18K Solution of Gold and Silver.

He explained how the difference in temperature, in current density, also whether the Cathode was in motion or still; just what per cent of metal in the Alloy was deposited.

This was a very instructive talk because, it described Research that the average Electroplater is unable to accomplish.

As this talk represented the first of the Dr's. Research and he is to complete the Research in the near future. We anticipate another good meeting next time. There was a general question period following the lecture. There were 11 present.

Mr. G. Klinkenstein will speak at the meeting December 17.

J. ANDREWS, *Sec.*

SPRINGFIELD BRANCH

Springfield Branch held its first Educational Session and Banquet on Saturday. Nov. 20, at the Highland Hotel.

P. W. Prouty, Westinghouse Company, was introduced by the President of Springfield Branch, Walter D. Barrus, as the presiding officer. Mr. Prouty called upon Mr. Walter R. Meyer, General Electric Company, Bridgeport to open the Educational Session. His subject was "Cyanide Copper Plating." Many illustrations accompanied this address and a long discussion followed.

The second speaker was Floyd F. Oplinger, of R & H Chemicals Dept., E. I. du Pont de Nemours Company, who spoke on "Practical Methods for the Disposal of Alkali and Metal Cyanide Solutions". Mr. Oplinger's subject was entirely new, and many questions were asked after the close of his address.

Gustav Klinkenstein of Maas & Waldstein Company, Newark, N. J., spoke on "Specialization of Finishes and its effect on the Work of the Electroplater". Mr. Klinkenstein, always an interesting speaker, pleased the audience immensely with the handling of his subject. All three speakers were given a rising vote of thanks.

The Banquet was a decided success. The extremely poor weather conditions may have decreased the attendance to some extent, but there was no lack of enjoyment in the ballroom. The fine attendance from Boston Branch helped considerably. They not only enjoyed themselves, but helped make everyone else happy.

E. M. Stephenson from Hartford presented some very fine pictures which were given to the ladies holding lucky numbers. One of the lucky women also received a handsome compact, a gift of the Lea Company.

Bert Sage of Boston Branch spoke on Reaserch and boosted the coming Educational Session and Banquet of Boston Branch on February 26, 1938. Mr. Collins, of M. E. Baker Co., pleased everybody by singing "When Irish Eyes are Smiling". The floor show and orchestra were all that could be desired. Dancing was enjoyed until midnight.

Purification of Nickel Solutions

Talk by G. B. Hogaboom, Jr.,
before Newark Branch, A.E.S.,
November 19, 1937.

Due to improvements in the art of electrodeposition it is becoming necessary to pay more attention to the details and the refinements of all steps used. Thus the impurities present in the chemicals used in making solutions is being brought under specification requirements.

Impurities in nickel solutions must be eliminated if best plating is to be obtained. Organic impurities which will come from solution being in contact with resinous woods, or fabrics containing fillers will cause brittle deposits. The effect of organic impurities is seen from fact that only 1/3 rd oz of gelatin per 100 gals of solution is enough to cause cracking of a nickel deposit.

Organic impurities can be removed by the use of absorbing materials such as wood charcoal or bone charcoal. The use of oxidizing agents such as chlorine, chromic acid, and potassium permanganate has been suggested but are not generally recommended, as excesses will cause trouble.

Organic impurities as well as metallic impurities such as iron, copper, zinc, and aluminum can be removed by method suggested by Liscomb which consists in raising pH of solution to 6.3, adding ferrous sulphate, and then 5% hydrogen peroxide. Iron hydroxide is precipitated which carries down all impurities.

Metal impurities can also be removed by "working" the solution as has been done for some time. It was suggested that if the pH of the solution is brought down by adding ½ to 1 pint of sulphuric acid to each 100 gals of solution that the plating out of contaminating metals like copper and zinc would prodeed without undue deposition of nickel. Samples were shown that had been plated from a solution containing 1 oz/gal of zinc. After electrolyzing the solution at low pH the zinc was removed and a good nickel deposit obtained. This method is easier than a precipitation and filtration method.

Question: *Had users of bone char obtained good results?*

Answer: In case of nickel solutions char only partially removed impurities. In case of silver solution char was successfully used to remove excess or improperly dissolved carbon disulphide.

Question: *Would it not be better in the Liscomb method if the peroxide were added first, so as to oxidize all iron and then to use ferric chloride instead of ferrous sulphate?*

Answer: Thought this would be better as then only ferric hydroxide would be formed, instead of some ferrous hydroxide, which latter is more difficult to filter. Actual tests should be made. Some stated better results were had with ferrous sulphate.

Question: *Why did Liscomb recommend nickel carbonate instead of ammonia for raising pH of Watts type nickel solution?*

Answer: So as not to introduce ammonium salts into hot nickel, which have tendency to make a brittle deposit. It was also stated that Mr. Anderson of N. J. Zinc Co. has found that carbonate will cause brittle deposits so that in preference to nickel carbonate the plater should use nickel hydroxide. This can be made by dissolving single salts in water, adding a solution of caustic soda, allowing precipitate to settle, and decanting supernatant liquid. Then clean water is added to wash the precipitate, which is again allowed to settle and water drained off. The precipitate is added to the nickel solution.

Membership Report

To December 1, 1937

ELECTIONS

M. R. Moody, 126 So. Short St., Troy, Ohio — Associate, Dayton Branch
Lewis Smith, 22 South Cherry St., Troy, Ohio — Active, Dayton Branch
Harry J. Misner, c/o Max Wocher Co., 29-31 West Sixth St., Cincinnati, Ohio — Associate, Dayton Branch
William A. Burke, 2707 - 74 Ct., Elmwood Park, Ill. — Associate, Chicago Branch
Jack E. Morgan, 1542 N. Kedzie Ave., Chicago, Ill. — Active, Chicago Branch
Steve Pribesh, 224 Dover St., Bridgeport, Conn. — Associate, Bridgeport Branch
Henry G. Zubin, 195 Placid Ave., Stratford, Conn. — Associate, Bridgeport Branch
Oscar B. Moe, 716 N. 11th St., Milwaukee, Wis. — Associate, Milwaukee Branch
Irving M. Hermann, 906 E. Bay St., Milwaukee, Wis. — Active, Milwaukee Branch
Hermon S. Hunt, S. S. White Dental Mfg. Co., Princes Bay, L. I. N. Y. — Associate, Newark Branch
Samuel Zimmerman, 349 Crown St., Brooklyn, N. Y. — Active, New York Branch
Phillip Ranno, 1816 White Plains Ave., Bronx, N. Y. — Active, New York Branch
Joseph T. Montgomery, 24 Davie Ave., Somerville, Mass. — Active, Boston Branch
Joseph P. Laskey, 3 Foster St., Haverhill, Mass. — Active, Boston Branch
Frank R. Keller, 815 Ferree St., Coraoplis, Pa. — Active, Pittsburgh Branch
Robert R. Flaherty, 47 Sacramento St., Cambridge, Mass. — Associate, Boston Branch
Robert Andris, 74 Sunnyside St., Hyde Park, Mass. — Active, Boston Branch
Benson Lister, 84 Lester Ave., Newark, N. J. — Associate, Newark Branch
John R. Gumm, 71 38th St., Irvington, N. J. — Associate, Newark Branch
William A. McCudden, 229 4th St., Newark, N. J. — Active, New York Branch
Norman L. Prince, 31 Lux St., Rochester, N. Y. — Associate, Binghamton-Elmira Branch

APPLICATIONS

Joseph V. Petrocelli, 41 Brown St., Waterbury, Conn. — Associate, Waterbury Branch
Wm. T. Moriarty, 51 Ludlow St., Waterbury, Conn. — Associate, Waterbury Branch
Stanley Sharman, c/o Wurlitzer Co., No. Tonawanda, N. Y. — Active, Buffalo Branch
John D. Ellnor, 836 Kensington Ave., Buffalo, N. Y. — Active, Buffalo Branch
Harvey Slatin, 263 Ashland Ave., Buffalo, N. Y. — Associate, Buffalo Branch
Ralph T. Mead, 19 Doat St., Buffalo, N. Y. — Associate, Buffalo Branch
D. L. Ripley, 427 Olympic Ave., Buffalo, N. Y. — Associate, Buffalo Branch
Alfred J. Boy, 84 Verplanch St., Buffalo, N. Y. — Active, Buffalo Branch
Joseph Genco, Trico Products Corp., Buffalo, N. Y. — Active, Buffalo Branch
George H. Ambellan, 151 Amber St., Buffalo, N. Y. — Active, Buffalo Branch
Louis Nowakowski, Trico Prod. Corp., Buffalo, N. Y. — Active, Buffalo Branch
Michael Sahagio, 579 Union Ave., Bronx, N. Y. — Active, New York Branch
William F. Newbery, High St., Radburn, Fairlawn, N. J. — Associate, Newark Branch
Fred A. Kelm, 25 Concord St., Jersey City, N. J. — Active, New York Branch

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Meyer Roter, 48 N. Hermitage Ave., Trenton, N. J. Active, Newark Branch
Martin Horvath, Jr. Vlchek Tool Co., Cleveland, Ohio
Active, Cleveland Branch
Christian C. Boehm, Boehm Surgical Instrument Co., 205 St. Paul St., Rochester, N. Y. Associate, Rochester Branch
Paul H. Tufts, 11 Ware St., Williamson, N. Y. Associate, Rochester Branch
Harry F. Speary, 622 Bennington Dr., Rochester, N. Y.
Active, Rochester Branch
Wm. M. Tucker, Roll Ctg. Dept. Kodak Park, Eastman Kodak Co., Rochester, N. Y. Associate, Rochester Branch

SUSPENSIONS

Joe Ellis, 421 W. 58th St., Los Angeles, Cal. Los Angeles Branch
Ed. Cushing, 917 Cole Ave., Los Angeles, Cal. Los Angeles Branch
H. E. Randall, 5128 Marathon St., Los Angeles, Cal. Los Angeles Branch
J. F. Fleckenstein, Box 941, Los Angeles, Cal. Los Angeles Branch
Herbert J. Quigley, 35 Olney St., Dorchester, Mass. Boston Branch
J. Mattil, 4220 Wilder Ave., New York City, N. Y. New York Branch
Jacob Reingold, 673 Saratoga Ave., Brooklyn, N. Y. New York Branch
Stanley Schubert, 3334 203rd St., Bayside, L. I., N. Y. New York Branch
Fred Luzuis, 3704 West 130th St., Cleveland, Ohio Cleveland Branch

REINSTATEMENT

Clarence Folz, 1009 Haynes St., Dayton, Ohio Dayton Branch

DECEASED

Leo Schmidt, 1732 Girard St., Chicago, Ill. Chicago Branch

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Industro Bright Pickle is a non-fuming acid solution, which is made in concentrated form and diluted with three parts of water. It is used at room temperature. Articles to be pickled are first cleaned with a hot alkali cleaning solution. (Industro 5B, a cleaner used for brass without tarnishing, is particularly suitable for this purpose), and then immersed for about one minute in the Industro Bright Dip Solution. The pickled article is then rinsed, preferably in hot water, and allowed to dry.

The very desirable results described are secured by the formation of an invisible and protective chemical coating on the surface of the metal. No lacquer is used.

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The Abstract Section

R. M. GOODSELL, *Chairman, Program and Educational Committee*

METALS AND ALLOYS ABSTRACTS

Pickling and Annealing of Brass. *Machinery*, (London), Vol. **50,** June 3, 1937, pp. 288-89—Practical article on bright annealing of brass tubes. Weak sulfuric acid pickling solution forms no fumes, but as there is no mechanical action to assist in the descaling, the process is very slow. 10% sulfuric acid and 3% potassium dichromate is much faster. Nitro-sulfuric acid mixtures (bright dip) give a brighter surface, but are apt to attack metal excessively. PHIL J. RITZENTHALER.

Finishing Cemented Carbides. H. R. POWER. *Modern Machine Shop*, Vol. **9,** April, 1937, pp. 108-112—Practical article on finishing surfaces that have been hardened to a very high Brinell number as tungsten, tantalum, and titanium carbides. Use aluminum oxide wheels with speeds of 4000—4500 ft./min. The pressure of the piece against the wheel should be light to avoid excessive heating and wheel wear. Practical suggestions on equipment and procedure are given. PHIL J. RITZENTHALER.

Rapid Electrodeposition of Iron from Ferrous Chloride Baths. By CHARLES KASPER. *Metal Industry* (London), Vol. **51,** July 2, 1937, pp. 19-21—Original research. Ductile iron can be deposited from ferrous chloride solutions at current densities up to 280 amperes per sq. ft. which is several times the customary rate of iron deposition. Temperature and acidity of the bath must be maintained within narrow limits.

PHIL J. RITZENTHALER.

Heavy Nickel and Chromium Deposition. CHARLES F. BINILLA. *Metal Industry* (London), Vol. **50,** May, 1937, pp. 585-8—Description of the Fescol electrodeposition process as applied to recovery of worn machine parts. Nickel solution is purified by use of permanganate. Maximum thickness of nickel so far deposited to build up worn parts was 7/16" in diameter and required three weeks. No preliminary copper deposit used. Maximum chrome deposit is 0.1 inch which required several days.

PHIL J. RITZENTHALER.

Barrel Finishing of Metal Products: Cutting Down. (No. 10 in Series). H. LEROY BEAVER. *Products Finishing*, November, 1937, pp. 26-33—Article discusses barrel tumbling of metal parts for the purpose of "cutting down" or grinding — rough finishing, either previous to ball burnishing or for burr removal, etc. Three general types of barrels usually used:

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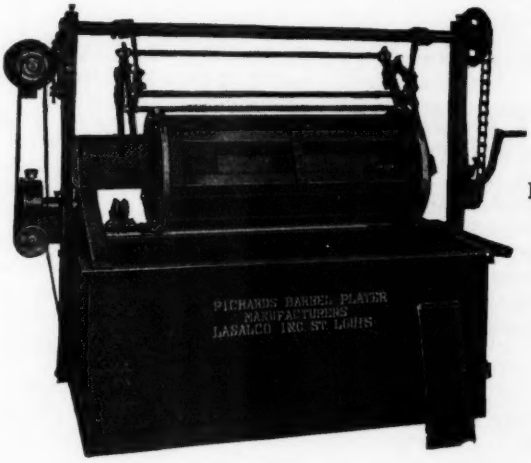

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(1) oblique type; (2) high and narrow Abbott type; (3) long and narrow Baird type.

Article corrects erroneous impression that barrel must rotate violently to get results. Relation of specific gravity of parts to be treated and of grinding mass is similar to that in ball burnishing.

Discusses new rubber lined sheet steel barrels which may triple the life of cast iron barrel. Cannot be used with sharp burred stampings or in presence of oil or chemicals. Best with water and abrasive only.

Barrel speeds recommended are from 25-65 R.P.M. depending on kind of barrel. Actual cutting due to pressure same as in burnishing. Author recommends manufactured abrasives of the silicon carbide type as much faster cutting than sand. Higher coat offset by longer use or re-use of abrasive.

PHIL J. RITZENTHALER.

Impurities in Nickel Baths and Their Removal. Anonymous. *Die Metallwaren-Industrie und Galvano-Technik*, Volume **35,** No. 17, September 1, 1937, page 357—Copper is frequently met as an impurity in nickel plating baths and in fact, completely copper free baths are seldom found. Fortunately, however, small quantities of copper are not harmful. Copper may enter the nickel plating bath through the hanging of copper or copper alloys in the bath without electrical contact or from copper objects which may have fallen to the bottom of the tank and more frequently, from nickel anodes or nickel salts which contain copper. An experienced person can detect the presence of copper easily by the color and appearance of the deposits. Such deposits appear mat gray and are difficult to buff and if the copper is in large quantities, the deposits will have a reddish copper appearance, especially if poor electrical contacts occur during the plating. The anodes will coat all over with copper during the interval between plating and the back sides of the anodes will be copper coated during plating operations. The copper is easily removed by inserting in the tank, large iron sheets as cathodes and electrolyzing with a potential of from .5 to 1 volts, whereby both copper and nickel will deposit until the copper is reduced to an amount which is harmless in the plating bath.

W. R. MEYER.

Rubber Electrodeposits (Gumminiederschläge). *Die Metallwaren-Industrie und Galvano-Technik.* Anonymous. Volume **35,** No. 17, September 1, 1937, page 356.—The production of rubber deposits by the use of electric current has been thoroughly described in 1935, and it has been shown that this deposition is not the usual electrolysis of the metal deposition type and is also not pure electrophoresis whereby one assumes the migration of non-metallic materials in colloidal solution under the influence of applied electric potential. Latex normally obtained from commercial sources is not an ionic solution, but an emulsion or dispersion, whose solid constituents, however, take on an electric charge opposite to that of the water and consequently are influenced by the electric current. The process of electrophoresis which

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causes the migration of the negatively charged rubber particles to the positive pole therefore can only be used for the production of fairly thin deposits, since the layer which forms is a non-conductor of current and insulates itself. Thicker deposits may be obtained by the fact that positive ions can migrate through the pores of the rubber layer. Latex had a pH of from 5.8 to 6.4, the precipitation occuring at a pH of 4.8 at the so-called iso-electric point of most protein. The formation of acid at the anode acts harmfully, but numerous oxidizable substances such as hydroquinone are added, or oxidizable electrodes such as zinc are employed to minimize the formation of oxygen. The rubber is deposited with D.C. current up to about 100 volts and deposits up to one inch have been obtained, but usually far thinner coatings than this are employed. Agitation is essential and corners, edges, cavities, etc., are well covered. The deposition, however, is not successful on every metal, but is successful on zinc, cadmium, lead, tin, antimony and alloys of these metals or deposits of these metals but is not successful on copper or nickel which cause disintegration of the rubber. Non-metallic articles may be coated with rubber by first graphitizing and in some cases, wax is used as a mold and is then melted out to leave a hollow shell of rubber. The numerous agents necessary for proper vulcanization of the rubber may be added to the bath and for example, the following bath would give good results:

Rubber	106 grams
Sulphur	15.1 "
Zinc Oxide	22.7 "
Lampblack	6.8 "
Diphenylguanidine	.7 "
Water	1 litre
Current Density	15-150 amp/ft^2

Naturally all these materials do not dissolve in the solution but are maintained in suspension. W. R. MEYER.

The Copper Plating of Steel or Cast Iron Cylinders Used in Printing. I. SPORTELLI. *Galvano* (Paris), June, 1937, page 14—Copper plating of printing cylinders saves copper, affords a better quality of surface, and lowers the cost as compared with cylinders made entirely of copper. For the rotogravure and heliogravure processes in printing, cast iron cylinders with a cyanide copper undercoat for the acid copper deposit are used. The adherence of these deposits is insufficient to withstand the pressures used in printing fabrics. For this purpose steel cylinders with a nickel deposit underlying the final copper coating, are recommended. The nickel coat is made in seven minutes at 10 amp/sq.ft. and 18°C from a bath containing 200 g/l $NiSO_4$, 30 g/l $MgSO_4$, 30 g/l H_3BO_3. The cylinder is rotated during deposition of both nickel and copper. The copper is smoothed down with agate blocks during deposition. Other formulae and details of procedure are given. C. T. THOMAS.

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at The Palmer House. The Educational Session will be held from 2 to 4.30 P. M. The Banquet will be held in the GRAND BALL ROOM at 7 P. M. sharp. Tickets are $3.25 each and can be secured now from the Secretary, J. W. Hanlon, 3004 N. Whipple Street, Chicago, Ill.

CHICAGO BRANCH BIDS YOU A HEARTY WELCOME

Testing and Stripping of Electrodeposits (Chromium) by DR. B. EGEBERG and N. E. PROMISEL, *Metal Cleaning and Finishing*, Vol. **9,** No. 10, page 831, October, 1937—Tests for determining the hardness, wear, resistance, and porosity of chromium deposits are given. Hardness may be indicated using the scratch tests or on thick deposits the Bicker's diamond point. Wear tests may be conducted by various means; a machine measuring the depth of cut under certain conditions is described. The wear resistance may also be determined by measuring the amount of energy necessary to remove a definite amount of the metal, and also by having fine sand or other abrasive fall under a constant "head" and through a small opening on the chrome surface inclined at an angle of 45 deg.; the weight of sand used to wear through the plate determines the resistance to abrasion. Eight methods for showing the porosity of chromium are given: 1. salt spraying; 2. the ferricyanide test; 3. copper plating in an acid solution using .2 volts and observing the cracks; 4. if the chrome is direct on steel immersing in the acid copper shows the cracks; 5. or by immersing in distilled water at a temperature of 205 to 210 deg. F.; 6. if the chrome is on nickel applying a solution of two grams dimethylgloxime in a liter of ammonium hydroxide (one part in one part of water) produces a pink coloration in the cracks after 12 hours; 7. if the chrome is on zinc, aluminum and their alloys, cracks may be detected by the appearance of bubbles when the piece is immersed in a 10 per cent solution of caustic at 160 deg. F.; 8. cracks may also be seen by means of a low power microscope. WM. C. GEISSMAN.

Specifications for Electroplating Chemicals by M. W. SCHWARZ, *Metal Industry*, Vol. **35,** No. 10, page 505, October 1937—The author states the advantages of having definite standards for the chemicals and anodes used in the plating industry and suggests that the plating industry adopt uniform specifications for their raw materials. Some specifications for plating chemicals and anodes that have already been given by various authors and departments of the United States Government are listed.

WILLIAM C. GEISSMAN.

A Study of the Rochelle Salt-Copper Plating Bath, by DR. A. KENNETH GRAHAM and HAROLD J. READ, *Metal Industry*, Page 559, Volume **35,** No. 11, November 1937—The importance of pH of the Rochelle salt copper bath is stressed in this article. The variations of pH with concentration of sodium bicarbonate, sodium carbonate, sodium hydroxide, sodium cyanide, and sodium potassium tartrate (Rochelle salt) in pure water were noted over a range of zero to .4 ounces per gallon.

The changes in pH of the copper bath itself are studied by varying the various constituents of the bath itself. Finally the variance of pH obtained by adding varying amounts of sodium hydroxide to different types of Rochelle salt copper baths are studied. The paper will be concluded in a later issue.

WILLIAM C. GEISSMAN.

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The Plating of Zinc Alloy Die Castings and Rolled Zinc by E. A. ANDERSON, C. E. REINHARD, W. W. KITTLEBERGER, *Metal Cleaning and Finishing*, Vol. **9**, No. 9, Page 721, September, 1937—The plating of nickel, nickel-copper combinations, and chromium on zinc alloy die castings and rolled zinc is described in this article. Among the subjects discussed are polishing and cleaning prior to plating, purification of solutions and specifications of thickness of plates. In plating, coatings over .0005" are best produced by three main systems: 1. nickel direct; 2. copper nickel; and 3. nickel-copper-nickel. The author prefers the nickel direct method. Directions for operating a nickel sulfate-sodium sulfate bath, a concentrated nickel sulfate-sodium sulfate bath, and a nickel sulfate ammonium chloride bath are given. The latter bath may be used only after a strike coating has been applied. The copper nickel deposit is made by the deposition of copper from a cyanide bath at least .0002" thick and nickel from any warm nickel solution to a thickness of .0008". The nickel-copper-nickel deposits are obtained by plating .0002" of nickel from a sodium sulfate-nickel sulfate bath and following with .0004" of copper from an acid copper bath and ending with .0004" of nickel from a warm nickel bath. The article will be concluded in a later issue of the magazine. WILLIAM C. GEISSMAN.

The Plating of Zinc Alloy Die Castings and Rolled Zinc by E. A. ANDERSON, C. E. REINHARD, and W. W. KITTLEBERGER. *Metal Cleaning and Finishing*, Vol. **9**, No. 10, Page 839, October, 1937—The stripping of nickel from the die castings is discussed, a sulfuric acid and glycerine solution being recommended. Three methods of measuring the thickness of coatings are described: 1. the microscopic method; 2. the micrometer method; and 3. the stripping analysis method. The microscopic method described is the conventional one in use. In the micrometer method a strip of strong paper is glued to the nickel deposit, and the zinc base is dissolved, leaving the deposit glued to the paper. The paper is then removed and the deposit may be measured with a micrometer. In the stripping analysis method a known area of the piece is stripped by placing it in a solution of water, 1 part; sulfuric acid, 2 parts; nitric acid, 1 part; hydrochloric acid, 1/16 part or by using reverse current in concentrated sulfuric acid. The nickel in the solution is determined by 1. the dimethylgloxime method; 2. the electrolysis method; and 3. the cyanide method. The dimethylgloxime method is recommended; with the weight of the nickel known the thickness of the nickel may be determined. WM. C. GEISSMAN.

The Passivity of Metals. Its Applications to Electroplating. J. LIGER. *Galvano* (Paris), October, 1937, page 19—Concluding a series of articles on passivity in electroplating, the author defines this phenomenon as the "state of inertia of a metal to manifest certain essential properties." This inertia is due to the presence on the surface of the passive metal of an extremely thin invisible film. To platers this may appear as anodic passivity, passivation by action of air or of the baths, protection by superficial oxidation, difficulties in replating, or in nickel plating objects from an alkaline cleaner.

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Means of combating passivity are classified as: 1st, chemical, including the presence of chlorides in nickel baths, free cyanide in cyanide baths, sufficient acidity in nickel and zinc baths, acid rinse after degreasing, avoidance of oxidizing agents, such as chromic acid, in rinse waters or in baths other than chromium plating, etc.; 2nd, mechanical, including scraping, brushing with pumice, etc.; 3d, electrochemical, including reduction of oxide skin in degreasing bath, anodic oxidation where passivity is desired for protection, etc.

Causes of passivity are listed as the action of oxygen or of air, action of oxidizing agents such as chromic acid, chromates, or nitric acid, and the formation of insoluble basic salts on the surface of the metal.

C. T. THOMAS.

Some Practical Advice for Electroplaters. A. DARLAY. *Galvano* (Paris), September and October, 1937—In considering failures of chromium plating not traceable to the chromium plating bath itself, the author finds that passivity of the nickel undercoat is a frequent cause of trouble. This must be taken into account in preparing the nickeled surface for plating. Plating as soon as possible after the polishing operation is advised, to avoid the passivation due to long exposure to the air. The author claims that the tendency of the nickel undercoat to become passive may vary with the composition of the nickel plating bath, but he does not go into detail on this point.

In addition to passivity, insufficient thickness of this undercoat of nickel, or a porous condition of the nickel deposit may be responsible for defects that appear when chromium plating is applied, defects which are often wrongfully attributed to some fault in the chromium plating process.

C. T. THOMAS.

A Study of the Rochelle Salt — Copper Plating Bath. DR. A. KENNETH GRAHAM and HAROLD J. READ. *Metal Industry* Vol. 35 No. 11, November 1937, pp. 559 - 561—This is the first of a series of articles dealing with the pH. charactersitics in a Rochelle salts-copper bath. Sodium bicarbonate, sodium carbonate, sodium hydroxide, sodium cyanide and sodium potassium tartrate (Rochelle salts) were first added to pure water one at a time and pH readings were taken. Tables and curves plainly illustrate the pH reactions and values in each case. Copper Rochelle salts plating bath was next studied. Soduim carbonate, free cyanide and Rochelle salts have no effect on the change in pH. Sodium carbonate shows quite a raise in pH. Conclusion baths containing little or no soda ash maintain practically the same pH above 10.7. Below this pH, baths with carboantes are buffered; those with no carbonates are not buffered. The easiest pH to maintain is values above 12.0. A pH between 11.0 and 12.0 are sensitive to change due to hydroxide concentration. Part 11 of this paper will deal with the effect of pH upon anode behavior.

ROBERT B. GOODSELL.

THE BUYERS' GUIDE—Continued

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Here and There

Since it was decided to hold a meeting of the Revision of the Constitution Committee in Detroit, Sunday, Dec. 5, we thought it advisable to visit some of our mid-western branches. One of the best meetings attended for some time was held by Toledo Branch on Thursday Eve., Dec. 2. There was a fine attendance, a splendid feeling, and an eager lot of listeners. Questions were asked and answered and after the meeting refreshments were served. President Stanley Moore, Sceretary Walter Weiker, and the other officers of Toledo Branch are to be congratulated for a well-conducted and interesting session. We had a pleasant time and hope to see you all again.

Went from Toledo to Dayton, but found their meeting was postponed on account of Dr. Blum's lecture on Research the following week, but met Mr. Conley, President of the Branch, Mr. Powell, Secretary, and Mr. Berner. Also had the pleasure of spending a few hours with Mr. Walter Fraine at his home. Mr. Fraine looks very well indeed, and desires to be remembered to all his friends in the A.E.S.

After the Detroit meeting, the details of which appear on another page, we spent a day in Chicago visiting Frank and Jim Hanlon, Al Gilbertson, and Oscar Servis. Oscar took us through the different departments over which he has supervision at the Felt & Tarrant Company and the splendid layout, ventilating system, cleanliness, racking methods, etc., gave proof of the utmost efficiency and the minimum of confusion with which Oscar handles his work, even though it is a big job. All four members of Chicago Branch are keenly interested in the success of the Annual Educational Session and Banquet which will be held on Saturday, January 15. It was good news to hear that the plating shops owned by the Hanlon Bros. and Mr. Gilbertson have had a nice run of business. The former specialize in zinc base die castings, while the latter cater mostly to the more precious metals, silver, gold, platinum, etc. Both have the reputation of doing first class work in their respective lines which accounts for their continued success in business.

Providence Branch will hold a meeting on Friday night, December 17. Mr. Gustav Klinkenstein of Maas & Waldstein Company, Newark, will be the speaker. There should be a good attendance at this meeting.

Dr. Blum has visited many of our branches during the past week, speaking at Detroit, Dayton, Anderson, Philadelphia, and Waterbury on Research.

Don't forget St. Louis Branch Banquet, Saturday, January 22, 1938. Bert Daw of Lasalco Co. is Chairman, which means a successful and interesting event.

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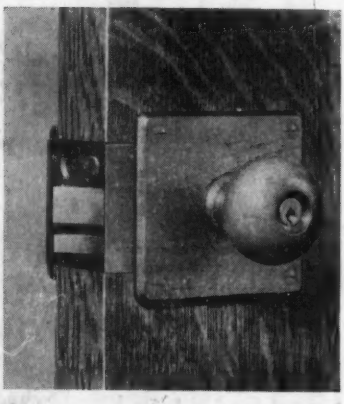

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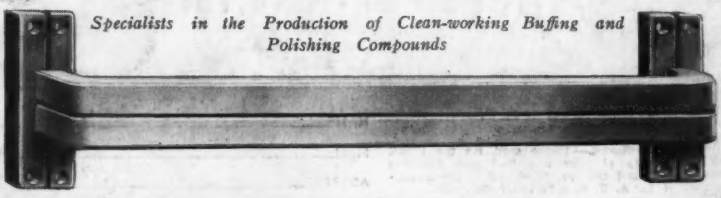
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